November, 1949

EDISON ELECTRIC INSTITUTE BULLETIN

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UBLISHED MONTHLY BY EDISON ELECTRIC INSTITUTE

ELECTRICAL RESEARCH STATISTICS
THE ELECTRIC LIGHT AND POWER INDUSTRY

Current Statistical Data Covering 100 Per Cent of Industry

August, 1948-1949

SOURCE AND DISPOSAL OF ENERGY—MONTH OF AUGUST

	1949	1948	%
GENERATION* (Net)			
By Fuel Burning Plants	17,671,921,000	17,506,351,000	+ 0.9
By Water Power Plants	7,349,039,000	6,736,006,000	+ 9.1
Total Generation	**25,020,960,000**	**24,242,357,000**	+ 3.2
Add—Net Imports Over International Boundaries	95,800,000	92,000,000	+ 4.1
Less—Company Use	117,137,000	118,576,000	− 1.2
Less—Energy Used by Producer	524,350,000	514,024,000	+ 2.0
Net Energy for Distribution	**24,475,273,000**	**23,701,757,000**	+ 3.3
Losses and Unaccounted for	3,706,490,000	3,521,272,000	+ 5.3
Sales to Ultimate Customers	**20,768,783,000**	**20,180,485,000**	+ 2.9

CLASSIFICATION OF SALES

NUMBER OF CUSTOMERS As of August 31st			
Residential or Domestic	34,736,576	32,853,172	+ 5.7
Rural (Distinct Rural Rates)	1,769,378	1,649,032	+ 7.3
Commercial or Industrial:			
Small Light and Power	5,251,649	5,098,690	+ 3.0
Large Light and Power	229,993	204,712	+12.3
Other Customers	144,910	138,216	+ 4.8
Total Ultimate Customers	**42,132,506**	**39,943,822**	+ 5.5
KILOWATTHOUR SALES—During Month of August			
Residential or Domestic	4,421,932,000	3,823,584,000	+15.6
Rural (Distinct Rural Rates)	873,038,000	731,953,000	+19.3
Commercial or Industrial:			
Small Light and Power	4,032,982,000	3,728,494,000	+ 8.2
Large Light and Power	10,129,873,000	10,648,263,000	− 4.9
Street and Highway Lighting	202,074,000	188,685,000	+ 7.1
Other Public Authorities	592,359,000	502,412,000	+17.9
Railways and Railroads:			
Street and Interurban Railways	285,204,000	305,180,000	− 6.5
Electrified Steam Railroads	184,926,000	199,440,000	− 7.3
Interdepartmental	46,395,000	52,474,000	−11.6
Total to Ultimate Customers	**20,768,783,000**	**20,180,485,000**	+ 2.9
Revenue from Ultimate Customers	**$382,161,300**	**$356,863,000**	+ 7.1

RESIDENTIAL OR DOMESTIC SERVICE

AVERAGE CUSTOMER DATA—For 12 months ended August 31st			
Kilowatthours per Customer	1,645	1,521	+ 8.2
Average Annual Bill	$48.86	$46.09	+ 6.0
Revenue per Kilowatthour	2.97¢	3.03¢	— 2.0

(*) By Courtesy of the Federal Power Commission.

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ISON ELECTRIC INSTITUTE BULLETIN

me 17 NOVEMBER, 1949 No. 11

Having Faith—And Going Forward

By Elmer L. Lindseth

President, The Cleveland Electric Illuminating Company and President, Edison Electric Institute

A talk at the Press Conference held in connection with the 70th Anniversary of the Incandescent Light, Biltmore Hotel, New York City, October 18, 1949

the week of October 16 to 22, he electric light and power com-panies this year commemorate the anniversary of the invention of the descent electric lamp by Thomas Edison—the invention that pro- the foundation for the modern rical industry.

his last message to the electric light power companies, delivered at their ention at Atlantic City in 1931, Edi- said to us: "Have faith—go for-d."

'e have faith—faith in the Ameri- system of freedom with free enter-e! And we are going forward in faith—the fastest-growing industry he nation!

et's take a look at how the electric ty industry has grown in the twenty rs since the world celebrated Light's den Jubilee—the fiftieth anniversary Edison's invention of the first prac-l incandescent lamp—in 1929; and s project its possible growth in the t twenty years.

Power Sales

During the past twenty years the elec- light and power industry—including electric utility companies, and the vernmental agencies — has increased ctric sales 3 1/3 times, and power nt capacity 2 times. Of the total es 85 per cent are being made by the vestor-owned companies.

While sales of kilowatthours have ne up 3 1/3 times, revenue from sales ve gone up less than 2½ times. This due to lower electric rates, which have n made possible despite higher costs by improvements in design, construction and operation.

It also reflects improvements resulting from constant striving for better efficiencies and economies.

Projecting the trends of the past twenty years over the next twenty years indicates that by 1969 annual kilowatthour sales will reach 850 billion, kilowatt capacity 200 million, annual revenues $11½ billion, and property and plant $65 billion.

These figures are not a forecast. Long-range forecasting is both difficult and inexact, in a fast-growing industry like ours. So instead of forecasting the industry's growth for the future, I have merely projected its size on the arbitrary premise that the rate of growth in the next twenty years will be the same as that of the past twenty years.

Please note this premise carefully. It is arbitrary. But the results are astounding. It is not at all unlikely that by the time of Light's Centennial Jubilee, in 1979, the electric utility industry will be selling altogether a trillion kilowatthours a year, and so we will be in a new series of figures—the trillions.

Financing

The six-year, nine-billion-dollar construction program, which the privately-owned electric light and power companies of the nation started right after the war, is more than half completed.

About 60 per cent of the financing of this post-war six-year construction program also has been completed.

Of this 60 per cent, $2,265 million has come from the companies' internal sources of cash, as follows: depreciation reserves, $1,342 million; other reserves, principally retained earnings, $643 million; and cash, $280 million.

The rest, amounting to $3,120 million, has come from the sale of securities as follows: bonds, $2,100 million; preferred stocks, $435 million; and common stocks, $585 million.

There remains to be provided in the remainder of this year, and in the next two years, funds aggregating about $3,615 million. It is presently estimated that $1,500 million of this sum will come from the companies' internal sources, as follows: depreciation reserves, $930 million; other reserves, principally retained earnings, $350 million; and cash, $220 million.

The remainder, totaling about $2,115 million, will come from the sale of securities as follows: bonds, $1,400 million; preferred stocks, $290 million; and common stocks, $425 million.

Investor Relations

To date the securities of the electric utility companies have been well received by the investing public, and we are doing all things possible to insure the continuance of a healthy market for our forthcoming issues.

Our relations with our investors are of the best, and we aim to keep them so by maintaining a record of adequate earnings to safeguard existing investment in these properties and to attract additional investment as required to provide more service, for more uses, by more people. Doing this is a genuine ser-

vice to the general public and the national economy.

In any discussion of the electric utility business we are confronted with an extraordinary paradox.

The relations of our business with its customers are at an all-time high. We are growing at a rapid rate. Rates are low, as evidenced by the fact that the cost of electricity today is relatively the lowest item and best value in the family budget, or in any other budget.

But, notwithstanding an excellent record of performance, our business is faced with extensive encroachment on the electricity utility field by the federal government, and nationalization of whole segments of this major basic industry.

Construction

Since V-J Day, four years ago, the electric light and power companies of the nation have expended about Five and a Half Billion Dollars to expand and improve electric service.

We will invest over Two Billion Dollars in new property and plant this year.

By the end of 1951 we will have invested over Nine Billion Dollars in our post-war six-year construction program.

This Nine Billion Dollars is *all private capital* that is being put to use for the public service and benefit.

Throughout World War II we supplied plenty of power on time for war production and all other essential purposes. However, the war prevented us from making normal additions to our systems. But those years our Army, Navy and Air Force, such projects as Oak Ridge, and our allies had first call on all the new electric equipment that could be produced. It went to war, and properly so.

For the past two years, it was nip-and-tuck to meet the rising demands for electricity with the facilities we had, and all we could add by pressing new construction with utmost vigor.

But now we are over the hump!

Our six-year construction program will add about 21 million kilowatts to our power production capacity. This is a 52 per cent increase over our capacity of 40 million kilowatts on V-J Day. It is more than half completed.

During the same six-year period, the Federal Government will have built 3,050,000 kilowatts of capacity, and municipal and other local public agencies will have built 1,850,000 kilowatts, a total of 4,900,000 kilowatts.

Reserve Capacity

In our business we regard reserve capacity of 15 per cent as necessary and adequate to meet in full the requirements of both our national peacetime economy and national security.

The record of the industry during the war years was a good one. Secretary Krug, then head of the power branch of the War Production Board, said, "Power was never too late or too little."

Following the war, in 1946, the demand for electricity started to rise much faster than additional capacity could be constructed.

In 1947 we had reserve capacity of only 5.4 per cent, and last year it was only 5.9 per cent.

By the end of this year we expect to have built our reserve capacity up to 11.5 per cent, probably nearer 14 per cent. Next year we expect to have reserve capacity of more than 15.0 per cent, and in 1951 reserve capacity over 18.0 per cent.

Sales Promotion

With our population increasing and the uses of electricity multiplying, future demand for electricity has literally no limits.

But we do not sell electricity *per se*. We sell use of electricity. We have to sell electricity by promoting the sale of appliances and equipment that use electricity, from television sets to electric furnaces.

We are local businesses. Therefore, we have to build our home markets—our local area markets. This is the economic reason why so many of our companies engage in area development—in upbuilding the industry and the agriculture of the areas they serve.

We are helping to develop the electrical market by sales engineering and sales promotion, by ringing doorbells and by advertising.

Ours is a volume business. The bigger our market, and the better our load diversity, the more economically we can produce and distribute. I think universally we believe and practice this philosophy.

Customers

Since the war our customers have increased in numbers more than ever before.

Twenty years ago the electric utility industry served 24 million customers. Its generating capacity was about 30 million kilowatts, and its electricity production 92 billion kilowatthours.

At the beginning of October the ...dustry—including company and gove... mental utilities—had over 42 milli... customers, generating capacity of o... 60 million kilowatts—more than dou... the 1929 capacity; and an annual p... duction of 290 billion kilowatthours... over three times the 1929 productio...

Residential

During the past 20 years the numb... of residential customers served by t... industry has increased from 20 milli... to 35 million—up 75 per cent.

By next year-end we estimate electr... service will be available to 97.5 p... cent of our occupied dwellings, and ... per cent will be using it.

On the average the American ho... today uses three times as much electri... as in 1929.

But while average home use has i... creased over 200 per cent, the avera... residential bill has gone up only 48 p... cent.

The explanation is that the avera... residential rate for electricity today ... less than half what it was 20 years ag...

Although electricity is now so vit... to everyday life in the United Stat... that its economic and social value ca... not be estimated, it has become a ti... item in the family budget.

When the cost of living hit a ne... peak in 1948, and the year's averag... index rose from the 1935-39 base of 1... to 171.2—up 70 per cent—the co... parable index of the cost of electrici... was only 89.4—down 10 per cent.

In 1948, according to Department ... Commerce figures, electricity took le... than nine-tenths of 1 per cent of th... family consumer expenditures. By co... parison, tobacco and smoking suppli... took over 2 per cent.

The cost of electricity today is rel... tively the lowest item and best val... in the family budget, or in any oth... budget.

In the 1939 census, manufacture... showed that electricity cost 1.4 per ce... of value of finished product, and th... ratio has gone down in the 10 ye... since.

Farms

By New Year's Day 85 per cent ... all farms will have electric service, a... it will be available to an additional ... per cent.

Not all farmers take electric servi... even though our lines pass the farmy...

ate. We still have the job of selling ir service to many farmers.

Come year-end, the electric companies ill be serving 2,400,000 farms; the EA Cooperatives 2,350,000 farms; and e municipalities and various other cal public agencies, 230,000 farms.

The electric companies are supplying t wholesale rates about 60 per cent of e power distributed by REA coopera-ves.

The electric companies are supplying ooperatives at much lower average rates an REA generating plants charge the ooperatives.

The latest REA reports reveal that e average price the companies charged ooperatives is 9.5 mills per kilowatt-our, while the average price the REA enerating stations charged the coopera-ves they served is 13.6 mills—that is, 3 per cent more than the companies harged.

While the farmer's average use has ncreased over 200 per cent in 20 years, s average annual bill has increased nly 31 per cent.

Farm-line Extension Almost Complete

In another two years the task of tak-g electricity to the farms of the United tates will be practically completed.

Nevertheless, REA is now erecting ower plants where power is already vailable at rates below what it will ost these REA plants to generate power.

Further, REA is now constructing ransmission lines that duplicate the ines of electric companies' established ystems.

The cry that the REA must build ower plants and transmission lines to ake up a power shortage is generally ntrue.

Only last week agents of the REA were in Ohio seeking to get the distribu-ion cooperatives there to borrow Fed-ral money for the construction of a gen-rating plant and a duplicating trans-ission system at a cost of more than 12 million.

These facilities would not provide ser-ice to a single additional farmer (99.4 er cent of all farms in Ohio already ave electric service). Neither would hey result in any reduction in cost. ather, the opposite is the case. This roject would result in increased cost o these farmers. Yet, in their zeal to rect competing systems, agents of the ederal government are thus seeking to and out the taxpayers' money.

There is no need for such REA projects. They constitute an economic waste. They are piling a needless and unjust burden on our taxpayers.

We don't believe the people of America want this—or that the farmers want it, either.

There is no limit to what the REA fallacies may lead to, unless the whole REA scheme of things is reviewed, clarified and controlled. This is properly a job for Congress.

Economy and Efficiency

It is significant that the national average price of electricity per unit in 1948 was 17 per cent less than in 1939; and the average residential price per unit for 1948 was 25 per cent below that 10 years ago.

This represents a phenomenal achievement in view of the fact, that like everyone else, the electric companies have been plagued by the great rise in construction and operating costs since the war.

The cost of various items we use has increased anywhere from 50 per cent to 200 per cent. For example, the cost of building a steam-electric plant has gone up as much as 75 per cent per kilowatt.

With costs rising much faster than revenues, our companies naturally have been driving harder than ever to develop all possible new improvements in efficiencies and economies.

The Public's Money

In general, our companies have mutually satisfactory relations with their customers and employees, the general public, and the regulatory agencies.

The money invested in our companies is the public's money. Invested in these companies, this money sustains genuine public ownership of a public service, operated for the public and regulated by the public.

Whether our companies seek either debt capital or equity capital, they must compete with many other large enterprises seeking capital.

Because ours is a low margin-capital business, none of our companies can finance its requirements for additions to property and plant out of its retained earnings.

Therefore, each must attract additional investment; and to do so, must maintain a record of earnings that will convince investors of the safety of its funds and the prospect of an adequate returns for its use.

The history of the electric utility business indicates that no sound power project has as yet come to light which is too great for private capital to finance. But uneconomic projects—large or small—do not attract private capital.

There is no escaping the fact that this business has the responsibility to earn an adequate return for *the investors*. It is in the interest of our customers that we do this. The return must be sufficient to enable it to attract more capital, to provide more service, as our customers require it.

Socialization By Taxation

It is inherent in our business that we share the ups and downs of our customers, individually and collectively.

Their interests are our interests. What helps our customers, helps us. What hurts our customers, hurts us.

Today there impends over this interest a menacing cloud which is casting an increasingly broader and blacker shadow.

That is the trend toward an even more socialistic Federal government, as demonstrated specifically by the developing socialization of the electric light and power industry.

In 1933, Federal and municipal electric light and power systems were serving 2,200,000 customers, or 9 per cent of the nation's total.

Today they are serving 7½ million customers, or 19 per cent of the total, with power costs heavily subsidized by the taxpayer, and preference clauses discriminating against electric customers who pay their own way.

Up to 1930, the Federal government had built only 17 small hydroelectric plants, each of these as an adjunct to an irrigation dam. Total installed capacity was 226,000 kilowatts.

Now one of the Hoover Commission reports brings us up to date as follows:

a. As of June 30, 1947, the Federal government had plants with a capacity of approximately 5 million kilowatts. It had additional plants under construction with a capacity of 8½ million kilowatts. And construction authorized by Congress contemplated almost 7 million kilowatts more.

b. Thus in 1960 the Federal government will have in operation 172 plants with a capacity of about 20,233,637 kilowatts.

In 1932—17 years ago—the electric companies served 94 per cent of the electric utility business of the country.

Today, due to the invasion of this

field by the Federal government, the electric companies serve but 85 per cent of the business.

The Federal government has usurped this business through competition based on discriminatory taxation and other financial devices.

The electric companies are gravely concerned, and we believe the American people should be gravely concerned, by these maneuvers. We believe the press should be.

It is plainly contrary to sound principles of economics and democratic government that taxes collected from our self-supporting electric companies be used to help support competing, government-owned electric systems which are largely tax-exempt; and which, in addition, are subsidized out of taxes collected from the public.

Tax Subsidies

It likewise is plain that the American system of freedom of enterprise cannot survive indefinitely under a regime which divides a major basic industry into two parts; one part that is taxed, and the other part that is tax-subsidized.

The Federal government today is taking as taxes over 11 per cent of the total revenues which the electric companies receive from the sale of electricity. These are Federal taxes only.

But the government power systems pay no Federal taxes.

This differential of 11 per cent shows there is no magic in the government's claim that it can produce and sell power at lower prices than the electric companies.

Nevertheless, this claim — repeated over and over by government power propagandists—results in unjust, adverse criticism of the companies' rates.

There is no denying that the propaganda claiming the government projects supply power cheaper, is harmful to the companies; even though the government actually does not supply power cheaper, will all tax-exemptions, tax-subsidies, and accounting practices measured.

The fact is that government power rates are subsidized by the taxpayers.

Aside from paying no Federal taxes, and generally little or no local taxes, the government power projects pay: (1) no interest whatever in some cases, and only partial interest in other cases; and (2) the allocations of total cost of multiple-purpose projects charged to power production are open to question.

We in the electric light and power business do not believe that the American people want a socialistic state. However, there is a very grave danger that they are having socialism envelop them without their realizing it.

We now have information that Federal power agencies are becoming very active in New England.

Socialization has made great inroads on our industry. But we hope that by exposing the facts to light, we can stem and then reverse this tide.

Principles

What are we *for?*

We in the electric utility business have a philosophy of being *for* things—not just *against* them. Witness our record.

The electric companies believe in the sound economic development, use and conservation of the nation's natural resources in the general public interest.

We recognize that there is a need and a place for government functions in respect to river development for water supply, flood prevention, reclamation and navigation, and the by-product generation of electricity where this is a sound operation.

We are willing and eager to cooperate in such development; to buy power from the government at fair prices, and to transmit, distribute and sell it at fair prices under strict regulation of prices and service.

We vigorously oppose the encroa ment by government into the field private enterprise and the electric li and power business, in respect to tra mission, distribution and sale of el tricity, and discrimination against customers of our companies.

Companies generally do not object Federal subsidy of rural distributi lines—if this be the national policy to service rural areas not already serve But they do object to (1) duplicati existing facilities, and (2) erecting co peting plants.

There is no foundation to the cl by proponents of government power t the Federal government must extend operations in the electric service busin because of the inability or unwilling of our companies to supply services.

We maintain that the electric ind try is a business that involves m more than the production and deliv of energy.

Our business is fundamentally a s vice business; and our companies more than three generations have d onstrated that they do a superior job supplying complete electric service to consumers.

These, briefly, are the highlights the picture we would like to leave w you today. Should you want any furt data on any point, we will do our b to get them for you.

"Simplified Electricity for Utility Workers" Is New Course Prepared by P. R. Rutledge

BETTER employee understanding of the overall operation of his electric company is one of the primary objectives of the newly published training course, "Simplified Electricity for Utility Workers," by P. R. Rutledge, industrial engineering manager of Central Hudson Gas and Electric Co., Poughkeepsie, N. Y.

Also designed to aid electric company employees wishing to qualify for promotion, the new book, using a limited amount of arithmetic, provides a practical and easily comprehended guide to the fundamentals of electricity, covering as well the basic equipment and methods used in the generation, transmission, distribution and metering of electrical energy.

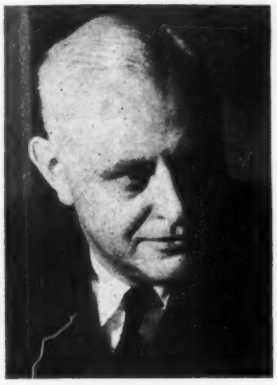
Based largely on suggestions of nontechnical employees, to whom it should be most valuable, the new course was reviewed during preparation by prac cal engineers in several large elect companies. In its final form, "Simp fied Electricity" consists of ten se rately bound units, attractively print and illustrated with photographs a diagrams, and a loose-leaf binder to used as a permanent container.

Following the first unit, "Our J with the Power Company," are un titled "Magnetism," "Introduction Practical Electricity," "The Terms W Use," "Sources of Electrical Energy "How A-C Behaves," "Electric M tors," "Transformers," "Instrume and Meters," and "Generation, Tra mission, Distribution."

The complete course is now availab from Delmar Publishers Inc., Alba N. Y., at $10 per copy. Further inf mation may be obtained by writing the publishers.

EEI General, Accounting, and Engineering Committees Seek Efficiency, New Ways to Serve Public

ELECTRIC service might have been seen in a new light by the American public if it had been possible for the electric industry's 42½ million customers and 3 million stockholders to attend a recent "get-acquainted" dinner-meeting held by President Elmer L. Lindseth for EEI Committee



ELMER L. LINDSETH

Chairman of the Board of Directors, EEI, and also President of the Institute. Mr. Lindseth is President of The Cleveland Electric Illuminating Co., Cleveland, Ohio.

chairmen. As each chairman gave a brief informal description of the duties and goals of his committee, few electric customers could have failed to be impressed by the comprehensive and continuing attention being given to his electrical living; and electric company stockholders would have gained further confidence in the efforts of their electric companies to increase the effectiveness and value of their investment.

In working committees now totaling 45 in number, some 1100 committee members devote their time and energy to the study of specific problems of electric operation, always with the ultimate aim of providing more efficient electric service and developing more ways in which electricity can serve. Individual compensation for this work can only be considered in terms of satisfaction in job well done and increased knowledge in a chosen field.

All committee activities, and Institute functions and policy as well, are under the guidance of the Board of Directors, composed largely of chief executives of member companies. An Advisory Committee, consisting of 24 electric company executives, acts in a consulting capacity on matters of broad electric utility policy.

Reporting directly to the Board of Directors and under its immediate supervision are EEI's 13 General Committees, dealing with accident prevention, codes and standards, the electric power survey, financing and investor relations, industrial relations, insurance, membership, prize awards, purchasing and stores, rate research, rural and urban development, statistics, and transportation. The Board exercises general control over the committees of the Accounting, Commercial, and Engineering Divisions.

> On an international plane, approval and admiration of EEI committee work was bestowed in sincerest form earlier this year when a Technical Aid Mission of the Organization for European Economic Co-operation, composed of leading electric system executives from nine European countries, recommended that "exchange of experience and ideas about power station operation should be encouraged and increased at all levels of employment. *It is felt that the functions so efficiently performed in this respect by the Edison Electric Institute in the United States should also be performed in Europe, preferably by a technical association of utilities. . . .*"

Three of the General Committees, the Electric Power Survey Committee, the Committee on Financing and Investor Relations, and the Rural and Urban Development Committee, began operation this year. While these and the other General Committees have continuing functions, the Board may authorize special committees from time to time to undertake specific tasks.

Since committee plans and activities of the Commercial Division for the current administrative year appeared in last month's BULLETIN, this survey of EEI committee work will cover the General Committees and those of the Accounting and Engineering Divisions.

Codes and Standards Committee

With J. T. BARRON of Public Service Electric and Gas Company, Newark, N. J., as chairman, the Committee on Codes and Standards has, in addition to jurisdiction over codes and standards, a primary responsibility for liaison between the electric industry and outside organizations.

Important inter-industry functions of the committee include cooperation with such groups as the National Electrical Manufacturers Association and the National Fire Prevention Association; supervision of electric industry representatives on committees dealing with coordination of plant facilities of the telephone, telegraph, and railroad industries; and supervision of electric industry participation in some sixty committees of the American Standards Association.

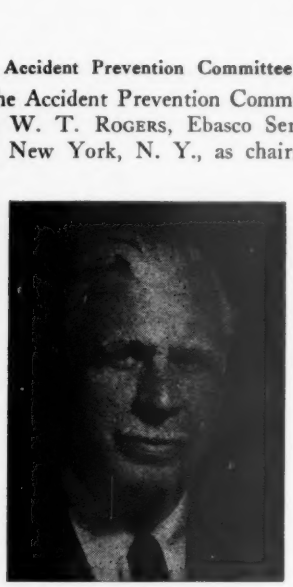
J. T. BARRON

Chairman of the Committee on Codes and Standards — Vice President in Charge of Combined Operations, Public Service Electric and Gas Co.

EEI General Committees

Accident Prevention Committee

The Accident Prevention Committee, with W. T. ROGERS, Ebasco Services Inc., New York, N. Y., as chairman,



W. T. ROGERS

Chairman of the Accident Prevention Committee—Safety Consultant, Ebasco Services Inc.

does not and cannot stop accidents. The actual job of accident prevention must be done by the operating forces of the companies themselves. The Committee's job is to study the trends, analyze the causes, prepare accident prevention material such as procedures, specifications, educational matter and the like, and to assist and inspire in every way possible the executive and supervisory people in the member companies to do their job of preventing accidents.

Committee work is divided roughly into three spheres of activity:

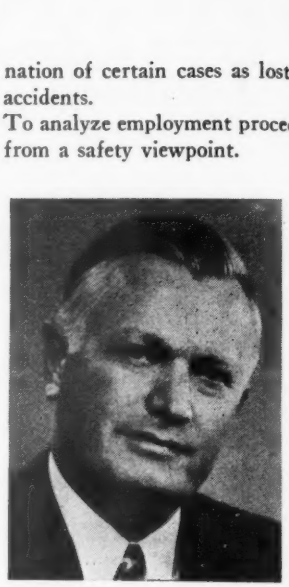
1. Through subcommittees, it prepares statistical reports and studies, specifications, pamphlets, posters, films and other training aids for distribution to the membership.
2. Meetings of the Committee arrange for full discussion of hazards, accidents and prevention measures, and promote a free exchange of information and ideas.
3. Through publicity, educational work and propaganda, and the use of "safety multipliers," it endeavors to obtain positive directed action in accident prevention on the part of executives, supervisors and other committees of the Institute.

The Committee, through its subcommittees, is carrying on continuing research in such matters as statistics, review and analysis of fatal accidents, resuscitation techniques, specifications for tools and equipment, and particularly protective equipment, study of hazards peculiar to generation, transmission, distribution, stores, motor vehicles, office, meter reading, etc. It also prepares educational and training material such as posters, sound-slide films, booklets and other aids. Projects for the coming year include continuing work on specifications for rubber gloves, line hose, sleeves, hoods and blankets; publication of a pamphlet on Use and Care of Hot Line Tools; distribution of a report on Safeguarding of Work Areas; preparation of a pamphlet on Generating Station Accidents, a sound-slide film on generating station accidents, posters applying specifically to the electric utility industry; preparation of the sound-slide film on public hazards; specifications on Body Belts, Straps and Climbers; publication of a booklet on training with particular reference to safety; a report on the Safe Handling of Poles; and publication of a booklet and a study of Edison Medal Cases.

Meetings of the committee are planned for midwinter in Texas, to give members in the South and Southwest an opportunity to attend, and another tentatively scheduled for September, 1950, to be held in Salt Lake City. Round table discussion and exchange of accident experience will be emphasized at these meetings, while verbal reports of subcommittee activities will be kept to a minimum.

Subcommittees are now being formed to translate into action the suggestions of presidents of member companies made in reply to letters sent out by past-presidents of the Institute, C. E. Oakes and E. R. Acker, which called for direct action to improve electric company accident records. Several suggestions selected for immediate attention are:

1. To develop principles to obtain executive interest, and demonstrate to employees that executive concern exists.
2. To make on-the-scene studies of specific safety methods used by companies having the best records.
3. To study the basis for the claim that there is a difference in interpretation of standards and designation of certain cases as lost-time accidents.
4. To analyze employment procedures from a safety viewpoint.



WALKER L. CISLER

Chairman of the Electric Power Survey Committee — Executive Vice President, The Detroit Edison Co.

5. To devise plans for improved training of supervisors and foremen.
6. To apply safety materials specifically to electric industry jobs, particularly with regard to work exposure to electric shock and burn.

Electric Power Survey Committee

The Electric Power Survey Committee was appointed in March, 1947. Its purpose is to conduct periodic surveys of (a) the electric power situation throughout the United States with regard to capabilities, loads, and reserve margins and (b) scheduled production of heavy electric power equipment and open manufacturing capacity available for producing additional equipment. The establishment of this committee provided for a continuation, on a voluntary basis, of a function somewhat similar to that performed during the war years by the Office of War Utilities of the War Production Board with which the members of the committee and many others taking part in its work were associated.

The importance of this committee, at the time of its appointment, was emphasized by the unprecedented rate of growth of the postwar loads and the need, both from the standpoint of the national economy and national defense, for factual information concerning probable future loads and the ability of the

country's expanding electric power systems to serve them. Orders for great quantities of new electric generating equipment had been placed immediately following the war, but considerable time was required for manufacture of such equipment. Also, the manufacturers were confronted with reconversion adjustments, material shortages, and manpower problems. Thus it was not until 1947 that any appreciable amount of new postwar equipment became available. Meanwhile, loads grew and reserve margins decreased.

The committee conducted its first survey in the spring of 1947. Since then surveys have been made at semi-annual intervals, the sixth having been completed in October, 1949. A report of this sixth survey will be issued at an early date.

Members initially appointed to the committee are WALKER L. CISLER, chairman, The Detroit Edison Co.; C. W. MAYOTT, vice chairman, Hartford Electric Light Co.; V. M. Marquis, American Gas and Electric Service Corp.; and J. E. Moore, Ebasco Services Inc. Recently added to the committee is N. B. Hinson, Southern California Edison Co.

Cooperating with the committee are representatives of the electric power systems, or power areas, in all parts of the country who report complete information concerning the electric power situation in their own areas. The information is reviewed and coordinated at semi-annual conferences of the representatives and the committee. Data concerning estimated peak loads, expected capabilities, and reserve margins are then assembled on a national and a regional basis. The survey usually covers a period extending about three years or more ahead and includes actual results for the past year for reference purposes. In addition, the committee maintains an up-to-date map of the principal interconnected electric transmission lines in the United States.

Cooperating also with the committee are the country's principal manufacturers of heavy electric power equipment. During the semi-annual conferences they present complete data concerning shipments made, orders on hand, current production schedules, and open manufacturing capacity for production of additional equipment. Thus it is possible to examine the adequacy of manufacturing ability to meet the probable needs. The results of these surveys serve to maintain a comprehensive and up-to-date picture of the electric power situation during the years ahead, both on a national and regional basis. It is believed that the information is of great value to the electric power industry, both operating and manufacturing, and to interested governmental agencies and others.

C. E. OAKES

Chairman of the Committee on Financing and Investor Relations — President, Pennsylvania Power & Light Co.

Financing and Investor Relations Committee

The Financing and Investor Relations Committee, under the chairmanship of CHAS. E. OAKES, President of Pennsylvania Power & Light Co., Allentown, Pa., has its plans well under way for an active year. The major objective of the committee is to provide the electric industry, through research study and informal group discussion, data and information for the promotion of better investor relations and for the consummation of successful financing of the vast expenditures that yet confront the industry in its expansion program.

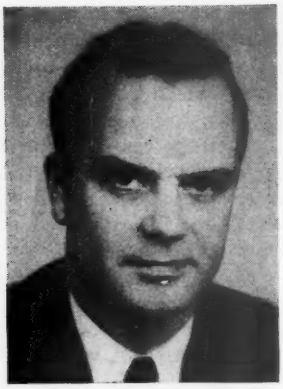
Upon the recommendation of its Planning Committee, under the chairmanship of A. F. Tegen, President of General Public Utilities Corp., New York, Chairman Oakes has made several assignments for subcommittee study looking to a two-day meeting on Dec. 15 and 16, when these items will be discussed at informal round table conferences.

The subjects to be covered by four subcommittees are:

1. A study of methods to create a wider market for equity securities, including cooperation with efforts now being made in this direction by the Stock Exchange. John S. Osborne, chairman.
2. Committee to study cooperation with other groups to work on the problem of double taxation, which is vitally affecting the equity security market. Harold Quinton, chairman.
3. Committee to consider a presentation of the Joint Committee on the Economic Report to the Congress of the United States. A. F. Tegen, chairman.
4. Committee to obtain information regarding security sales, such information to be transmitted to EEI member companies, explaining the "whys" and "wherefores" of the success or failure of security issues being made by electric utility companies generally. H. A. Busch, chairman.

The other items assigned by Chairman Oakes for study by individual committee members consist of the following:

1. A study of other factors which appear to have significant effect on the market value of common stock, such as the company's dividend practices.
2. A study of the effect of the equity capital ratio on the price of common stock, including consideration of the tax cost to a company because of high equity ratios.
3. A study of the relationship of annual dividend disbursements to total common stock equity and the effect, if any, of such relationship on the price of common stock. (This would show the stockholder's return on his total investment and would tend to minimize the effect of large non-recurring adjustments to earned surplus, such as the payment of stock dividends, etc.)
4. A study of employee and customer stock ownership, including a review of the past, why such programs did not work satisfactorily at the time, how conditions of today have altered the situation to make such programs feasible, what companies are presently doing with respect to such ownership plans, a statistical analysis to show the desirable market that exists in these two fields for common equity, the content and form of annual reports, etc.
5. A statistical study based on the experience from January 1, 1947, to date on dealer compensation in rights offerings. Similarly, a statistical study of dealers' discounts



S. F. LEAHY

Chairman of the Industrial Relations Committee—Director of Employee Relations, The Detroit Edison Co.

and commissions in connection with the sale of bonds, preferred stocks, and common stocks.

A1. A study of preemptive rights, including the advantages and disadvantages of the use of such rights, the necessity for such rights under charter provisions and state statutes, the SEC solution for eliminating the use of such rights, etc.

A2. A study of cumulative voting, including the necessity for such voting under charter provisions and state statutes and the advantages or disadvantages to the company as well as to the stockholder.

A3. A study of the potential markets for preferred and equity capital by sale to life insurance companies, fire insurance companies, investment trusts, pension trusts, college and educational endowment funds, etc.

A4. A study of over-subscription privileges in the issuance of rights; that is, the purpose of such privileges, the experience in recent years, the large amount of work required for a small percentage of over-subscription, if the original rights are largely exercised, etc.

A5. A statistical study of the spread between the price at date of right offering and the market price of the security at that time.

Industrial Relations Committee

The Industrial Relations Committee, S. F. LEAHY, The Detroit Edison Co., Detroit, Mich., Chairman, works in the important area of human relations in industry. The need for greater understanding of human relations problems is highlighted almost daily in the newspapers. Through mutual exchange of up-to-date information on all aspects of employee relations, committee members are able to help their companies solve the problems of the present, and plan for the future.

The Third Annual Industrial Relations Round Table conference, held at Chicago, Ill., Oct. 26-28, brought before committee members an exchange of information on currently important employee relations problems. Subjects of interest discussed at the meeting included: pensions, supervisor training, selection tests, opinion and aptitude surveys, employee communication programs, personnel research, employee aspects of public relations and executive development.

An industry-wide survey and report on personnel problems and programs of member companies will make available to cooperating companies in the current year complete and timely data on pay rates, pensions and other benefit plans, union agreements and personnel policies. This year's report will undergo extensive review to determine the best reporting methods and the usefulness of information exchanged. Special releases on Federal and State labor legislation, court decisions and arbitration awards having important implications for the industry and individual companies will be prepared and distributed to members by the Committee at intervals during the year.

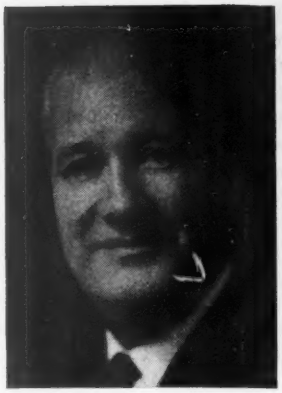
Of major value to its members is the Committee's relatively permanent membership which encourages acquaintanceships between individuals that often prove valuable in emergency situations between Committee meetings.

Insurance Committee

The Insurance Committee will continue its activities under the chairmanship of I. M. CARPENTER, Ebasco Services Inc., New York, N. Y.

While all the insurance problems created by the enactment of Public Law 15 are still not completely solved, the Committee feels that insofar as they relate to the electrical industry very favorable progress has been made.

The Committee's undertaking during the past year to improve the position of the electrical industry insofar as fire and allied lines of insurance are concerned, has also shown favorable progress. This activity will be pursued and a complete



I. M. CARPENTER

Chairman of the Insurance Committee — Manager, Insurance Dept., Ebasco Services Inc.

study is in progress at the present tim of the schedule for rating electric properties so that further discussion may be had with insurance compan interests.

This schedule under which electric properties are rated for fire insuranc has been in use for a considerabl number of years without any materi changes. It is generally conceded th the present schedule is not sufficient comprehensive to reflect the changes loss expectancy brought about by d velopments in the industry in rece years and to fairly rate electrical prope ties on the basis of improvements ma by the industry.

In cooperation with insurance co pany interests, important revisions a now under consideration and the Co mittee has been assured of full consid ation by the insurance company intere in any amendments or changes that a to be made.

In order to obtain more complete i formation as to what may genera be considered good practice in the i dustry, questionnaires were circulat recently among all member compani These questionnaires were designed develop information which will be u ful in the consideration of revisions this schedule. Answers are particula sought to questions dealing with t several types of generator and tra former equipment, special protective vices, maintenance procedures and g eral fire protection matters.

It is earnestly requested that th questionnaires be completed and turned to the Committee as expe tiously as possible. Only with t cooperation from the member compan

E. S. THOMPSON
Chairman of the Membership Committee — President, The West Penn Electric Co.

can the Committee hope to accomplish its aim.

As in the past, close cooperation with other Committees of the Institute will be continued.

Membership Committee

The Membership Committee has as its chairman, E. S. THOMPSON, The West Penn Electric Co., New York, N. Y.

All applications for membership in the Institute are examined by this Committee. Recommendations and reports by the Committee are made directly to the Board of Directors of the EEI.

Prize Awards Committee

The prize competitions sponsored by the Institute, with the exception of the Charles A. Coffin Award, are administered by the Prize Awards Committee under its chairman, G. E. WHITWELL, of the Philadelphia Electric Co., Philadelphia, Pa.

G. E. WHITWELL
Chairman of the Prize Awards Committee — Vice President, Philadelphia Electric Co.

The Committee appoints judges of the awards and seeks to promote a broad area of participation in each contest. New prize awards offered by various donors to be sponsored by the Institute, are reviewed by the Committee.

Full details on contest rules and prizes for 1949-1950 are given on page 423 of this issue of the BULLETIN.

Purchasing and Stores Committee

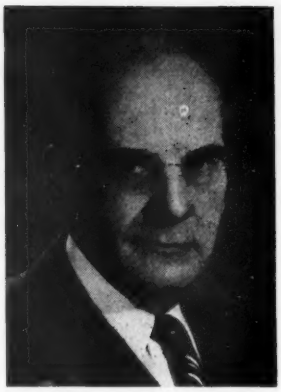
The Purchasing and Stores Committee, whose chairman is R. P. SNOW, The Cleveland Electric Illuminating Co., Cleveland, Ohio, has two separate functions: Purchases under vice chairman C. F. OGDEN, The Detroit Edison Co., Detroit, Mich.; and Stores under vice chairman H. E. HODGSON, Wisconsin Power and Light Co., Madison, Wisc. Programs conducted by each group frequently cross the line of interest between the two, and they also extend into the associated fields of salvage, accounting and personnel.

Subjects covered recently or contemplated for the current administrative year include a wide field, from the selection and training of personnel, to the use of labor saving machines and equipment. They include studies of office and record systems, salvage and scrap practices, programs for inventory reduction, systems of materials control, sources of information for keeping both Purchasing and Stores executives informed and many others.

Plans are already under way for the 1950 committee meeting to be held at Milwaukee, Wisc., on April 24-26. The seven subjects which have been assigned for presentation before the meeting are: machine vs. manual records, Standard Packaging, unit manhour costs for stores operations, determining when to buy, how does the purchasing agent keep informed on trends, on-the-job training, and materials control.

The Standard Packaging Subcommittee, which has done an excellent job on the standard packaging of line hardware, will continue to extend its activities into other fields. This subcommittee plans first to explore possibilities in the standard packaging of porcelain.

In cities where meetings are held, one day is always allotted to a tour of the Purchasing and Stores Departments of the local utility and usually visits to the plants of principal utility suppliers with local manufacturing plants.



R. P. SNOW
Chairman of the Purchasing and Stores Committee — Director of Purchasing and Stores, The Cleveland Electric Illuminating Co.

Rate Research Committee

The Rate Research Committee, with S. W. ANDREWS, American Gas and Electric Service Corp., New York, N. Y., as chairman, will continue its study of current rate problems. The Committee held its first meeting of the current year on Oct. 6-7 at Lenox, Mass., and has plans for two other meetings, one this winter and one in the spring. The EEI Rate Book is prepared under the direction of this committee.

The Committee, with the particular assistance of a subcommittee under the chairmanship of L. R. Lefferson, Ebasco Services Inc., New York, N. Y., will go into the matter of residential rates, especially in the light of the expanded use of electric service in the home, resulting from the new appliances which

S. W. ANDREWS
Chairman of the Rate Research Committee — Rate Engineer, American Gas & Electric Service Corp.

have been mainly developed in the post-war period, and also house heating.

Other subcommittees which are continuing include one on Electric Utility Costs, under the chairmanship of H. I. Miller, Wisconsin Public Service Corp., Oshkosh, Wis., and one on Return in the Electric Utility Industry, under the chairmanship of E. N. Strait, Pioneer Service and Engineering Co., Chicago, Ill. A subcommittee, with Arthur Schultheis, Central New York Power Corp., Syracuse, N. Y., as chairman, has been established to review the subject of general extensions. L. W. Frank, Western Massachusetts Electric Co., Springfield, Mass., will continue to keep track of and report to the committee on recent rate developments.

Cooperation with other divisions of the EEI on projects of mutual interest will continue as in the past.

The Rural and Urban Development Committee

The Rural and Urban Development Committee, headed by Chairman GEORGE R. KEEGAN, of the Western

GEORGE R. KEEGAN

Chairman of the Rural and Urban Development Committee—Director of Public Relations, Western Massachusetts Electric Co.

Massachusetts Electric Co., Springfield, Mass., is a newly organized general committee recently authorized by the Board of Directors of the EEI.

Its purpose is to study, compile and exchange information with respect to programs and materials used by electric companies to aid in the development of the areas they serve and to cooperate with electric companies and other organizations also working for such development.

This Committee, the personnel of which has only recently been completed, plans to hold an organization meeting after which it is hoped that regional meetings will be held as rapidly as possible in order that the Committee will be actively functioning during the early part of 1950.

Statistical Committee

The Statistical Committee, under the chairmanship of O. E. SMITH, Consolidated Gas Electric Light and Power Co. of Baltimore, Md., will continue

O. E. SMITH

Chairman of the Statistical Committee—Assistant to the President, Consolidated Gas Electric Light and Power Co.

active study of the industry's needs for reliable and accurate factual data presented in a manner most suitable for effective use by the electric industry and the public.

A proposed Index of Electric Power Output, compiled on a national basis, which is the result of considerable study by a subcommittee headed by Winsor Martin, Pioneer Service & Engineering Co., Chicago, Ill., is being brought to its final stage of completion in the current year. Another subcommittee, with H. A. Weitzman, Rochester Gas & Electric Corp., Rochester, N. Y., has a report on definitions relating to customer, service and load classifications ready for submission to the Institute for adoption.

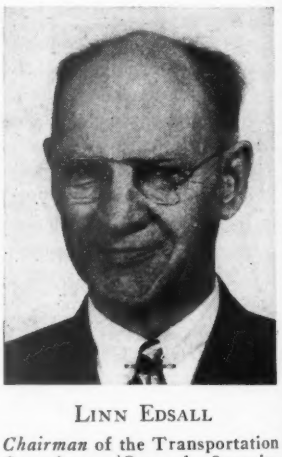
At its winter meeting to be held at Cleveland, Ohio, on Nov. 30 to Dec. 1, the Committee will consider the desirability of coordinating to a greater degree information requested by the Institute in its Annual Report form with that requested by the American Gas Association and by insurance companies.

The Committee will continue its practice of consulting with the EEI Statistical Department and reviewing the weekly, monthly, annual and special statistical data prepared by the department for the Institute.

Transportation Committee

The Transportation Committee, whose chairman is LINN EDSALL, Philadelphia Electric Co., Philadelphia, Pa., works to a great extent jointly with the Motor Vehicle Committee of the American Gas Association on problems of the operation and maintenance of motor vehicles and related equipment used by both electric and gas companies. The committee plans to hold an organization meeting concurrently with that of the operating section of the AGA to assign work for the current year.

An interim report by the subcommittee studying aerial ladders and towers and another by the subcommittee assigned to study pole derricks, have been tentatively scheduled for the organiza-



LINN EDSALL

Chairman of the Transportation Committee—General Superintendent, Philadelphia Electric Co.

tion meeting. It is planned to continue these activities with the same groups in the ensuing year and every effort will be made to complete the studies within that period.

The Annual Conference of Utility Fleet Operators for 1950, sponsored jointly by the AGA and EEI committees, will be held at Detroit, Mich., in April. This is the major meeting of the year planned by the committee, and will feature papers by prominent technical men of the automotive indus-

Accounting Division Committees

It is a well established custom for the Accounting Committees of the Institute to work closely with committees of the Accounting Section of the American Gas Association. All but a few accounting problems are basically the same for the electric and gas industries. Many large companies conduct both electric and gas operations and cannot afford the duplication of organization that would be required if the two activities were entirely separated. However, not only for these combination companies but for those which render either all electric or all gas service there is an advantage, in the accounting field at least, in pooling experiences and ideas. The projects briefly described here are, therefore, joint projects unless otherwise stated.

W. H. ZIMMER
Chairman of the Accounting Division Executive Committee — Vice President and Treasurer, The Cincinnati Gas & Electric Co.

Accounting Division Executive Committee

The Accounting Division Executive Committee coordinates and supervises all the committee work of the Accounting Division. It is headed for the current administrative year by W. H. ZIMMER, The Cincinnati Gas & Electric Co., Cincinnati, Ohio, and its vice-chairman is R. H. SMITH, The Cleveland Electric Illuminating Co., Cleveland, Ohio. In addition to its general oversight of all Accounting Division committee work it acts as a discussion group in which from time to time senior industry accountants can exchange views informally on major problems in accounting administration. Its subcommittees attack problems which are too broad for assignment to any of the standing functional committees of the division and which are worthy of more detailed study. Two such subcommittees which will undertake studies during the current year are:

Accounting Employee Relations — This committee's chairman is W. E. Sturm, West Penn Power Co. It is not yet decided to which of several possible projects it will devote its major efforts, but it expects to explore the subject of aptitude tests and one of the members of the cooperating AGA committee, W. P. Sweetman, Peoples Gas Light and Coke Co., has volunteered to obtain a colored movie illustrating the use of such tests for presentation at the joint accounting conference next April. Undoubtedly another project for study will be the training of future accounting executives. Still other possibilities for research and report are: administrative problems in connection with accounting personnel; recreation programs and other employee activities; standards of performance for general accounting employees; impact of machine accounting on employee relations; job evaluation; two-way lines of communication for accounting departments, and desirability of teaching accounting department employees more about the economic "facts of life."

Accounting Developments Service— This committee will continue under the chairmanship of C. J. Wardell, Commonwealth Services Inc., in its search for new ideas, procedures, machines, equipment, and devices that will help member companies improve their efficiency or reduce their costs, and in giving such suggestions publicity through periodic bulletins.

H. H. SCAFF
Chairman of the Committee on Application of Accounting Principles — Vice President, Ebasco Services Inc.

Committee on Application of Accounting Principles

This committee, one of the few without an equivalent among committees of the AGA Accounting Section, is under the chairmanship of H. H. SCAFF, Ebasco Services Inc., New York, N. Y., and vice chairman, A. E. PENN, Consolidated Gas Electric Light & Power Company of Baltimore, Md. It has no research projects but acts as a medium through which the impact of new accounting prinicples or new interpretations of old principles upon the electric light and power industry can be studied and representative industry attitudes expressed. Among other matters it will have before it during the year some S.E.C. pronouncements on financial statements of registrants which can have far-reaching consequences to the electric industry's unprecedented financing program.

Customer Activities Committee

The chairman of the Customer Activities Committee is J. D. ELLIOTT, The Detroit Edison Co., Detroit, Mich., and the vice chairman is R. B. MCCROREY, Georgia Power Co., Atlanta, Ga. Three standing subcommittees, each of which has a number of projects under way, divide the work of the committee.

J. D. ELLIOTT
Chairman of the Customer Activities Committee—Supervisor, Customers' Billing Dept., The Detroit Edison Co.

A. E. BAUHAN
Chairman of the Depreciation Accounting Committee — Engineer Ass't of General Auditor, Gas, Public Service Electric & Gas Co.

The Customer Accounting subcommittee under Chairman R. B. McCrorey has projects for the year which include:

1. Permanent numbering systems for customers' accounts to achieve maximum flexibility and simplicity.
2. Special problems in the billing of large industrial accounts (50 Kw up).
3. Directory of methods and procedures; useful in telling what the other fellow does.
4. Reconcilement of meter history records with customer accounts; best way to be sure that every customer with an active meter is billed.
5. "Question Box" to provide an opportunity for full informal discussion in a luncheon meeting at next Accounting Conference of practical problems not covered in papers or reports.
6. Utilization of spare time of "on call" employees, such as those on customer desk service.

The Customer Relations subcommittee with L. Stoecker, Public Service Electric & Gas Co., Newark, N. J., as chairman, has projects under way on:

1. Customer relations evaluation, a paper to be presented before the next joint Accounting Conference by Walter Keagy, vice president in charge of public relations of The Cincinnati Gas and Electric Company.
2. Customer relations training; use of manuals and films to train employees in best ways to promote maximum customer good will.

The committee likewise proposes an informal discussion at a luncheon meeting during the next joint accounting conference which will serve to bring out a number of customer service irritations and their cures.

The Credit and Collection subcommittee with Chairman S. C. Grant, Philadelphia Electric Co., Philadelphia, Pa., is studying changes in credit and collection practices; a study of developments in the last five years and probable trends for the next five.

A panel discussion will be held at the April, 1950, accounting conference dealing with three subjects of current interest in the field of credit and collection practice; (a) the customer history file, (b) use of collection agencies and (c) trend in use of collectors.

The committee will also hold a luncheon meeting at the spring conference which, as usual, will provide for informal discussion. No set program has yet been announced.

Depreciation Accounting Committee

The Depreciation Accounting Committee (which has no counterpart in the AGA Accounting Section), under the chairmanship of ALEX BAUHAN, Public Service Electric and Gas Co., Newark, N. J., vice chairman, G. T. LOGAN, Philadelphia Electric Co., Philadelphia, Pa., has an ambitious program for the administrative year 1949-1950. Its first job is the completion of "Methods of Analyzing and Estimating Life Characteristics of Utility Property" which has been under way for several years and is now in its final stages.

The Committee expects to take up as a major project of the current year a companion report on methods of computing or determining annual depreciation accruals and reasonable limits of a depreciation reserve, consistent with different theories for fixing a fair annual depreciation charge. The study is not expected to establish any rigid standards but to examine different "systematic and rational" methods of arriving at annual depreciation charges and the corresponding "reserve requirements." It is probable that no report will be ready until after the current administrative year.

Other projects under consideration by the Committee include: (1) the preparation of a resumé of depreciation accounting practices by member companies of the Institute; (2) a similar resumé for federal power developments; (3) a concise statement of the depreciation accounting requirements of federal agencies other than those dealing with electric utilities; and (4) an attempt to get more general agreement on precise definition of terms commonly used in discussions of depreciation accounting

H. S. KING
Chairman of the General Accounting Committee—Comptroller, Commonwealth Services Inc.

General Accounting Committee

In the wide area covered by the General Accounting Committee, whose chairman is H. S. KING, Commonwealth Services Inc., New York, N. Y., and whose vice chairman is L. C. PROVENCHER, The Detroit Edison Co., Detroit, Mich., the difficulty is to select the subjects which are of most immediate concern. This year's program will include the following projects, each developed by a subcommittee:

1. Cutting costs through improved systems and methods.
2. Internal auditing; further development of manual and other studies
3. Capitalization of overhead costs when and why not to capitalize.
4. Budgeting and forecasting; use for control of costs, why and how often revised, limits of accuracy
5. Preservation and destruction of records; further possibilities for reducing demand for storage space
6. Problems of small utilities; questions peculiar to utilities with less than 75,000 customers.
7. Licensed project accounting: meaning of "net investment" to licensees under Federal Power Act.
8. Uniform classification of accounts; proposed revision of operating expense classification.

F. E. DRAPALIK
Chairman of the Plant Accounting and Records Committee—Assistant Valuation Auditor, Union Electric Co. of Missouri

Plant Accounting and Records Committee

The Plant Accounting and Records Committee, whose chairman is F. E. DRAPALIK, Union Electric Co. of Missouri, St. Louis, Mo., vice chairman, C. E. RAINES, Central New York Power Co., Syracuse, N. Y., has agreed on a joint program with the Property Records Committee of the AGA, which will include the following projects, each to be developed by a separate subcommittee: (1) simplification of property records and field accounting, (2) aspects of betterment accounting and retirement principles, (3) cycle checking of inventories and (4) work order procedure.

Taxation Accounting Committee

The Taxation Accounting Committee, whose chairman is C. J. TRUDEAU, Wisconsin Electric Power Co., Milwaukee, Wisc., and vice chairman, C. WIGAND, Commonwealth Services Inc., New York, N. Y., will continue its practice of emphasizing informal discussion and exchange of views at three or four meetings held jointly with the Taxation Accounting Committee of the AGA. The first of these meetings during the 1949-1950 year was held in Chicago in October. Among the topics discussed were:

(1) efforts to repeal the discriminatory and administratively burdensome Federal Electrical Energy Tax; and (2) coordination through a special subcommittee of the efforts of those member companies still seeking relief under the provisions of Section 722 of the Internal Revenue Code from burdensome applications of the Excess Profits Tax.

C. J. TRUDEAU
Chairman of the Taxation Accounting Committee — Assistant Research Engineer, Wisconsin Electric Power Co.

Both of these projects will be continued during the year. Papers and reports presented at Tax Committee meetings which are more than technically interesting are duplicated from time to time and released to a select list of executive utility accountants not members of the Tax Committees. The next joint meeting of the Tax Committees is tentatively scheduled for February 7, 1950.

Engineering Division Committees

Six principal committees, with their administrative subdivisions and subcommittees organized for specific projects, make up the Engineering Division. These six groups, with their fluid internal organization, are geared to deal with any phase of the operation and maintenance of electric plant and equipment, and as a further concern, they have the responsibility of developing and recommending standards.

General recommendations brought forward by the engineering committees regarding various basic problems of design and standardization have recently had noteworthy influence on new plant and equipment being installed in the electric companies' expansion.

Engineering Division General Committee

Headed by Chairman E. W. DILLARD, New England Power Service Co., Boston, Mass., the Engineering Division General Committee is primarily a coordinating and supervisory group for the direction of the other five engineering committees and consists of the five committee chairmen in addition to fifteen member-company engineering executives selected as members-at-large.

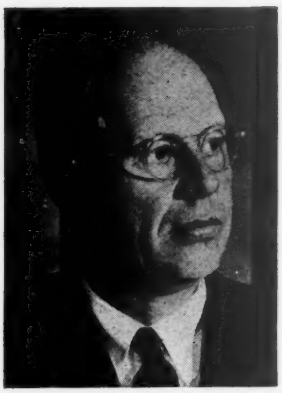
In its position of general responsibility for engineering committee activity, the Committee reviews and acts upon matters having broad economic significance for the industry, such as standards developed by individual committees, and may sponsor specific projects overlapping the fields of individual committee activities.

E. W. DILLARD
Chairman of the Engineering Division General Committee—Chief Engineer, New England Power Service Co.

Electrical Equipment Committee

The Electrical Equipment Committee, under its chairman B. VAN NESS, JR., Safe Harbor Water Power Corp., Baltimore, Md., and vice chairman J. H. FOOTE, Commonwealth Services Inc., Jackson, Mich., has sixty-three members representing fifty-two companies in the electric industry. In addition, there are accredited to the committee seven special representatives and also the fifteen corresponding members in eleven foreign countries of the committee's Foreign Practice Division.

On the Committee are specialists in electrical design, construction, system engineering, operation, maintenance and utilization. The work of the committee in these fields is carried on through informal round table discussions, presentation and discussion of formal papers, special working groups and subcommit-

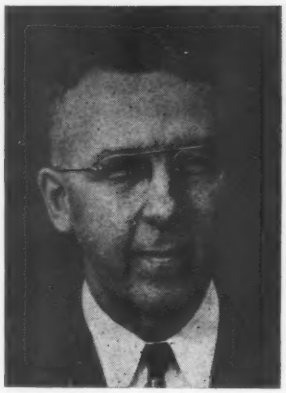


B. VAN NESS, JR.

Chairman of the Electrical Equipment Committee — Chief Engineer, Safe Harbor Water Power Corp.

G. J. VENCILL

Chairman of the Hydraulic Power Committee — Chief Hydraulic Engineer, Union Electric Co. of Missouri



H. A. BROWN

Chairman of the Meter and Service Committee—Sup't. Electric Meter and Test Dept., Rochester Gas & Electric Corp.

F. P. FAIRCHILD

Chairman of the Prime Movers Committee — Chief Engineer, Electrical Engineering Dept., Public Service Electric & Gas Co.

tees, and representation on joint groups with other societies. One day of each meeting is devoted to a closed session of the committee members; the second day generally being an open session.

For administrative purposes, the committee operates in five divisions each under a division chairman. These divisions are not considered to be subcommittees and members serve in all divisions. The five divisions and their chairmen for the current year are: Apparatus and Design Division, E. H. Snyder; Foreign Practice Division, A. V. DeBeech; Operation and Maintenance Division, C. L. Derrick; System Engineering Division, S. M. Hamill, Jr.; and the Utilization Division under A. C. Gohlke.

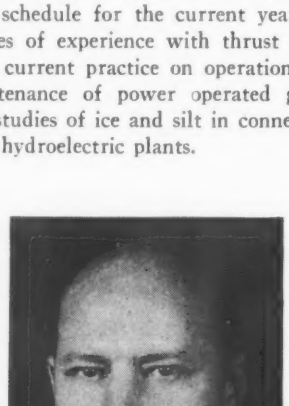
The first meeting for the current administration year was held at Schenectady, N. Y., on October 3 and 4, 1949, which was followed by a joint meeting and inspection with the General Electric Co. on Oct. 5, 1949. A winter meeting will be held in Cincinnati, Ohio, on Feb. 13 and 14, 1950. The spring meeting, preceded by a joint session with the Allis-Chalmers Co. in Milwaukee, Wis., on May 1, has been scheduled for May 2 and 3, 1950, at Chicago, Ill.

Hydraulic Power Committee

The Hydraulic Power Committee, led by chairman G. J. VENCILL, Union Electric Co. of Missouri, St. Louis, Mo., devotes its efforts to consideration of the design of hydroelectric power plants, their operation and maintenance. The Committee has a membership of thirty-six and is organized without divisions or subcommittees.

A limited number of prepared papers are presented at periodic committee meetings and sufficient time is reserved for round table discussion on subjects of general interest. A meeting is planned for May, 1950, in Chicago, Ill., and another meeting is under consideration for this winter.

Subjects of continuing interest on the program of the Committee include: concrete repairs, growth of concrete, maintenance and life of wood stave pipes, preservative coatings for and protection of metals in hydroelectric stations, and maintenance and repair of turbine runners. Also on the Committee's schedule for the current year are studies of experience with thrust bearings, current practice on operation and maintenance of power operated gates, and studies of ice and silt in connection with hydroelectric plants.



J. E. MCCORMACK

Chairman of the Transmission and Distribution Committee — Chief Distribution Engineer, Consolidated Edison Co. of N. Y., Inc.

Meter and Service Committee

The Meter and Service Committee is composed of forty members under chairman H. A. BROWN, Rochester Gas and Electric Corp., Rochester, N. Y. The Committee has an equal number of corresponding members who provide well distributed national representation.

The Committee is divided into twelve working subcommittees each having under consideration a specific problem or project pertaining to metering or service, such as the revision of the Metermen's Handbook, Service Devices, Meter Testing Equipment, Watthour Meter Development, Test Switches, etc. Industry standards on Watthour Meter Sockets and Indoor Current Transformers are nearing completion.

The vice chairman of the Committee is F. A. REDDING, Southern California Edison Company, Alhambra, Calif. and the secretary is C. E. Morey, Consolidated Edison Co. of N. Y., Inc., New York, N. Y.

Prime Movers Committee

This year the Prime Movers Committee enters its thirty-eighth year of service under a new chairman, F. P. FAIRCHILD, of Public Service Electric and Gas Co., Newark, N. J. He is the eighteenth to hold this position.

This committee is concerned primarily with problems of design, operation and maintenance of mechanical equipment in thermal-electric generating stations. By means of the questionnaire and frank round-table discussion, these men, about seventy in number, bring together the operating experience and thinking of the public utility industry toward the

(*Continued on page* 428)

Power Survey Lays Specter of "Impending Shortages"

Reserve Generating Capacity of 11½ per cent for December Peak Period—Doubling of 1940 Generating Capacity in Sight by 1952

THE specter of "impending power shortages" raised frequently in some quarters over the past several years should be laid by the just completed findings of the Power Survey Committee of the Edison Electric Institute, Elmer L. Lindseth, President of the Institute, said in releasing the results of the Committee's latest semi-annual survey.

11½ Per Cent Reserve Capacity

The survey establishes these facts for the immediate present and next few months:

The electric industry will have a reserve generating capacity of 11½ per cent, on a nationwide average, during the December peak load period—assuming that the steel strike is over by then and that the present loss of load due to this cause has been recovered. This margin contrasts with a 5.9 per cent reserve last December.

Generating capacity will have increased 26 per cent in three years' time by the end of 1949. This percentage represents over 13 million kilowatts of new capacity—an addition exceeding the total generating capacity of the industry in 1920.

New generating capacity installations are proceeding in accordance with schedules.

No power curtailment is in effect anywhere in the country, except in the Pacific Northwest where the extreme low river flow has caused the shutting off of some consumption; nor, with this exception, is any curtailment expected although an extreme drought in some other area depending primarily on hydroelectric power might slightly alter the situation for such an area.

Manufacturers of generating equipment are now able to produce 8 million kilowatts of steam-turbine capacity and 2 million kilowatts of hydroelectric capacity—a total annual factory production capability of 10 million kilowatts.

For the next three years, the survey indicates the following developments:

By the end of 1950, the normal generating reserve capacity of 15 per cent is expected to be reached.

For 1952, planned capacity additions thus far determined upon, and announced for the first time in this survey, will total 4,349,000 kilowatts.

During the postwar years 1947-1952 new generating capacity installations will reach nearly 30 million kilowatts, bringing the total generating capacity of the nation's electric industry to 80 million kilowatts. This figure is slightly more than double the generating capacity in 1940.

Eighty-one per cent of the new generating installations will use fuel, while the remaining 19 per cent will use hydroelectric.

* * *

Mr. Lindseth's complete statement follows:

"The Institute's semi-annual power survey takes in the entire electric power industry in the United States, including both the business-managed companies and the governmental power-producing agencies.

"The Power Survey Committee is comprised of Walker L. Cisler, executive vice president, The Detroit Edison Company, chairman; C. W. Mayott, assistant to the president, Hartford Electric Light Company, vice chairman; N. B. Hinson, vice president and executive engineer, Southern California Edison Company; V. M. Marquis, assistant planning and operating engineer, American Gas and Electric Service Corp.; and J. E. Moore of Ebasco Services Inc. Assisting the committee are engineers from every section of the United States, intimately familiar with the exact power situation in the areas which they represent.

"The committee surveys and reports on the generating capability for the entire country, coordination of operation and maintenance, status of capacity installations and the status of turbine-and-boiler manufacture.

Capacity Additions

"In the just completed survey of new capacity being added under the industry's expansion program, it was found that by the end of 1949, 13,182,918 kilowatts, or 26 per cent of the industry's total capacity in 1946, will have been added in three years. This three-year addition exceeds the industry's total generating capacity in 1920.

"More capacity will be installed during this year than in the previous two years combined. In 1947 and 1948, while the expansion program was gaining its full momentum, 6,243,217 kilowatts were added. The total for 1949 will be 6,939,701 kilowatts. Over 80 per cent of the 13 million kilowatt total will have been installed by privately-owned, business-managed electric companies, while about 20 per cent is accounted for by governmental installations of all types.

NEW GENERATING CAPACITY INSTALLATIONS

	Business-Managed Electric Company Installations	*Governmental Installations (all types)*	*Total Industry*
1947	1,651,937 kw	353,449 kw	2,005,386 kw
1948	3,394,403	843,428	4,237,831
1949	5,580,936	1,358,765	6,939,701
1950	5,060,550	1,177,085	6,237,635
1951	4,847,000	1,302,800	6,149,800
1952	2,516,900	1,832,400	4,349,300
Total	23,051,726 kw	6,867,927 kw	29,919,653 kw

"As may be seen from the table above, new capacity additions will be maintained at a high level through the end of 1952. The total of new kilowatts added during the six years from the end of 1946 to the end of 1952 will be 29,919,653 bringing the industry total of installed capacity to 80,236,274 kilowatts, in a 59 per cent increase over the 1946 figure of 50,316,621 kilowatts. The 1952 total of 80 million kilowatts is slightly more than double the country's generating capacity in 1940.

"Eighty-one per cent of the new gen-

erating capacity will use fuel, while only 19 per cent will be in hydroelectric installations. The effect of the expansion program on the ratio between the capacity of plants using fuel and hydroelectric plants is emphasized by a comparison of their percentages of total capacity over a twenty-year period:

	Fuel	*Hydro*
1932	73%	27%
1946	70	30
1949	73	27
1952	74	26

"The electric companies, installing approximately 3½ times the amount of new capacity scheduled for installation by governmental agencies, are putting most of their new facilities in steam plants, while hydroelectric plants compose the major portion of governmental installations.

"Although 1952 is now seen as the final year of the postwar expansion program, this does not mean that the construction of new facilities will stop, or even decrease to any great extent. Also, due to the postwar expansion in heavy electrical equipment manufacture facilities, the electric companies are not faced with the necessity of making firm commitments as far ahead as in the conversion period immediately after the war. Manufacturers of generating equipment are now able to produce at the rate of 10 million kilowatts of generating capacity annually—8 million kilowatts of steam-turbine capacity and 2 million kilowatts of hydroelectric capacity.

Reserve Margins

"Although the industry's building program was begun as soon as wartime restrictions were relaxed, it was well into 1947 before new generating equipment could begin to go on the lines in any quantity. During this time, reserve margins sank under the impact of unprecedented increases in electrical load, reaching a low of 5.4 per cent in 1947.

"At the end of 1949, however, a 11½ per cent margin for the industry is anticipated over the winter peak-load period. This estimate assumes that the steel strike will be over by then and that the present loss of load due to this cause has been recovered. By the end of 1951, when the expansion program is nearing completion, the margin will have climbed to over 18 per cent. A tabulation of the margins for the five-year period 1947 through 1951 follows:

Reserve Margins—Experienced
1947—5.4%
1948—5.9%

Reserve Margins—Expected
1949—12.0%
1950—15.0%
1951—18.0%

"The capacity margins now existing and to be expected should permanently lay the specter of 'impending power shortages' raised so frequently in some quarters over the past several years.

Curtailment

"During the war period, there were no curtailments of electric service due to lack of power capability. After the war, while the construction program was gaining headway, large increases in load combined with adverse hydroelectric conditions in some areas forced some curtailment. A large proportion of this curtailment was in interruptible load—load which was being carried with the understanding that it would be interrupted whenever the capacity situation made it advisable. Most of the curtailment was for a limited period over peaks and in no way approached the conditions experienced in Canada or Europe. There was never a question of 'the lights going out'—the total curtailment amounted to only 1 per cent of the peak demand.

"With the exception of the Pacific Northwest, where extremely low river flow has caused the shutting off of some consumption, no power curtailment is in effect anywhere in the country. No curtailment later is expected elsewhere, although an extreme drought in some other area might slightly alter the situation for such an area.

Regional Data on Reserve Capacity and Load Growth

"The composite picture of the power supply situation in the United States is built up from information covering eight main regions and the systems that supply them. The following table gives the percentage of reserve generating capacity for the years 1948 through 1952 and the per cent increase in load growth for the years 1949 through 1952 compared with the previous year in each case. The reserve capacity percentages are for median hydro conditions."

	RESERVE GENERATING CAPACITY Per Cent of Reserve Capacity Over Highest Expected Peak Demand					*LOAD GROWTH Per Cent of Increase in Power Demand Over Previous Year*			
Region	1948	1949	1950	1951	1952	1949	1950	1951	1952
Northeast	9.7	12.8	16.6	19.5	19.0	4.5	4.1	3.9	
E. Central	2.4	14.8	17.5	18.6	19.3	4.6	5.1	5.8	
Southeast	3.8	4.5	8.3	10.5	10.1	9.2	7.2	8.2	
N. Central	6.0	8.5	16.2	16.5	16.5	8.5	5.5	5.3	
S. Central	9.3	15.5	20.4	28.5	21.9	16.2	11.6	8.5	
W. Central	7.6	14.7	17.9	23.0	18.2	8.5	7.4	7.8	
Northwest	0.1	4.8	6.8	12.4	9.4	8.0	7.4	5.7	
East Div.	3.5	8.3	4.7	12.4	11.4	10.6	10.4	6.2	
West Div.	(0.6)	3.9	7.3	12.4	8.9	7.4	6.7	5.5	
Southwest	8.0	18.1	18.1	22.8	18.7	11.6	8.3	7.7	
TOTAL U. S.	5.9	11.5	15.1	18.0	16.9	7.5	6.2	6.1	

Practical Results of Rationing of Electricity in Paris

"ON Wednesday, the electricity is turned off. The hot, dry summer created a shortage of electric power. It became necessary to conserve this life line of contemporary existence. The method of conservation arrived at was to cut off electric power completely for part of one day each week. In the hotels this meant that you couldn't have any electric power except between 12 noon and 1:30 and after 7 p m," William F. McDermott reported from Paris, France, in the *Cleveland Plain Dealer,* September 27, 1949.

"It was not a matter of illumination solely," he went on to say. "The elevators could not operate without electricity. The toilets would not work. There was no water, hot or cold; you could not wash, shave, or attend to any of the ordinary needs of life.

"This deprivation of electric power was supposed to save electricity. Everybody turned on the lights when the light did not function and forgot to turn them out later when the power came on . . . It is completely idiotic because the waste is obviously very much greater than the small saving, in electric power. . . .

Production Incentives at Wisconsin Electric Power Company

By F. L. Larkin

Vice President in Charge of Personnel Services, Wisconsin Electric Power Company

An address before the Industrial Relations Committee Meeting, New York, N. Y., Sept. 29, 1949

FOR anyone in Wisconsin Electric Power Company to discuss or write about production incentive plans is about as novel and glamorous as a discourse on the merits of the incandescent lamp over the arc light. We adopted production incentives about the time we began to discard arc lights.

What are production incentives? They are things which antedate electric and gas utilities by several thousand years but which they generally do not have.

What are they for? They are part of a management's kit of tools—designed to increase employee wage earnings, improve job satisfaction and morale, lower operating and construction costs, reduce the cost of service to the public and increase earnings distributable to stockholders.

Sound Management and Efficient Labor

That statement sounds amazingly like Robert Nathan's thesis, as produced for the CIO. As a matter of fact, the only thing wrong with Mr. Nathan's program is that he wants to do all those things at one time — now — and without any improvement in productivity. We, at Wisconsin Electric Power, know that sound Management, in the usual sense of the word, aided by efficient Labor, recruited by modern selection methods, improved by adequate training programs, *and assisted by suitable wage incentives* can accomplish those things over a reasonable period of time.

One of the strange contradictions in modern industry is the picture of employee organizations "demanding" the very things production incentives will produce while at the same time demanding the elimination of the incentives—and—many industrial executives, hoping for the same objectives, who will not sit still long enough for a good Industrial Engineer to pronounce the words "Production Incentive."

We are not a big outfit—under 3,000 employees. Our operating area is reliable and conservative but not spectacular in any way. The annual average "straight time hourly earnings" of all "non-exempt" employees is higher than size and location would dictate when incentive pay and other special payments are included. The Company's service rates, for average or better consumptions, are shown by FPC reports to be among the low ones for systems distributing steam generated power—and we had a rate reduction in 1948. The Port Washington generating station held the heat economy record for many years. We unveiled a new, more efficient 80,000 kw unit at the plant so, over the long pull, Port Washington is still one of the top stations in the country for thermal efficiency and the system, as a whole, ranks high.

The Company's cost of Customer Accounting and Collections, again using FPC reports, is apparently the lowest, or next to the lowest. The system reliability is good, with the record for the twelve months ended July, 1949, showing two outages (on lines of 4,000 volts or above) due to errors in operation—man failures—and three due to chargeable equipment failures. The most recent published report shows consolidated earnings (including subsidiaries) of $2.05 per share of the 2,927,021 shares of common stock outstanding, including 22.5 cents per share due to non-recurring reductions in income tax liability.

One in a Whole Kit of Tools

Now don't get the idea that I am claiming that high wages, low operating and construction costs, high system reliability, reasonable corporate earnings and all those other things are clearly and directly the result of production incentives. Not by a long shot—but they help. I repeat that a wage incentive system is one of a whole kit of tools, and a very useful tool toward accomplishing such results, if properly designed, maintained and fairly administered. It helps supervisors attain their objectives.

One self-evident economic fact is that man, in general, produces best when he is working for himself; when all the fruits of his labors belong to himself alone. The proportion of workers who are the so-called "self-employed" has been steadily diminishing from ancient to modern times and has practically ceased to exist in some mass production industries. There is not much "self-employment" left in the large utilities.

The Will to Produce

Although the loss of individuality is regrettable in one sense, it is obvious that we could not have the industrial miracles and marvelous products and services of today, had not mass production superseded the self-employed craftsman. The modern "wage incentive" or "production incentive" is nothing more than an attempt to create a synthetic individual enterprise within modern industry; an attempt to extract, synthetically, the old "will to produce" which exists among workers generally only when the gains are proportional to the effort.

A second amazing fact is that although utilities spend endless hours and large sums of money devising more meticulous standards and specifications for purchasing equipment, materials, tools and supplies—such intricate niceties as painstakingly compounding samples of coal from hundreds of carloads and, by laboratory tests, determining minutely the precise heat content in British Thermal Units, the sulphur content, the moisture content, the ash content—and then turn right around and purchase millions of dollars worth of Labor on a basis measured merely by two hands on a clock going 'round and 'round. Perhaps slightly exaggerated, but it serves to illustrate the point.

Particularly in a utility, Labor is definitely not an end in itself. Our product cannot even be seen—you can't even smell it (we are an electric utility) and you should not touch it. It is consumed the instant it is produced. To mention a specific area of labor cost, a

utility is burdened with a terrific volume of record keeping—billing, accounting, collecting, etc. It is pure "overhead." No matter how beautifully our streamlined customer accounting division clicks it doesn't add a thing to the superb quality of our kilowatthours but it does affect the selling price. In our generating stations and switching stations, sweat and brawn do not produce electricity. Men are there because we have not perfected equipment. Line construction and maintenance employees are part of our transportation set-up—building and maintaining highways for getting our product delivered.

No More Than Needed

I am not belittling Labor. We are not planning to get along without Labor and we have as fine a group of employees as you can find any place—but, we do not want any more of them than we need. That is not only for the benefit of the electric service customer and the owner. It is for the benefit of the employees themselves in the form of good wages, good jobs, steady work and a lot of valuable fringe benefits.

Since we are dealing with the world's most intangible and elusive commodity —Labor—and inasmuch as the problem of improving employee performance is basically psychological — developing a desire to produce—the only way we can tie the problem down to earth is through the use of the so-called performance or production "standard." In other words, we must have a unit of measurement because without it we cannot even know our efficiency or output at the start and the employee will not have a target to shoot at.

117 Plans in Operation

The application of production incentives to the wide variety of operations characteristic of a public utility is not a question of adopting a single, all-inclusive plan. The nature of the work made it necessary for us to have a number of plans, tailor-made to fit the work they were designed to measure, that is, different units of measurement for each plan. We now have 117 plans in operation.

Out of approximately 2900 employees roughly 2600 receive a monthly bonus determined by some type of bonus plan. We call them "gain sharing plans" because any gain in efficiency or output is shared by the Company and employees. The employees excluded from participation are, in the main, officers and other supervisory personnel.

The plan which covers the greatest number of participants is the Power plant gain sharing plan. Made up of four parts—one for each of the four major generating stations, it provides an opportunity for about 850 operating and maintenance employees to earn a bonus based upon the economy of operation at those stations. It is practicable and effective.

Power generation is a good example of the type of production work where neither quantity nor quality of output, in the usual sense, are within the control of the employee. Method improvement in the sense of prepositioning materials, proper sequence and rhythm, elimination of wasted motion, use of both hands instead of one—none of these things apply. Assuming a Boiler Operator or Turbine Operator takes his readings with prescribed frequency and attention, it does not matter whether he steps directly up to the instruments or walks around the room ten times and then goes to the meters. Except in emergencies, the saving of time does not mean anything. There is no such thing as Grade A kilowatthours or damaged kilowatthours.

Bonus Plan Helps Save Btu's

Whether an 80,000-kw Turbine is carrying 80,000 or 60,000 or 40,000 is not for the operator to decide and his job doesn't change much anyway. There does not seem to be anything you can get a hold of, yet a fairly good incentive plan can be devised, and is worth while, because the performance of employees definitely influences generating costs. You can build a generating station engineered to produce a switchboard kilowatthour for, let's say, 10,500 Btu. Your operating force, very few men, can operate the station at 10,500 Btu, 10,800 Btu or 11,000 or more Btu and John Lewis has made those Btu worth saving. That is what the Power Plant incentive plan is for.

It would be wholly impracticable to establish a different incentive plan for each of the many jobs in a modern power plant. It almost has to be a single, overall plan. At least 37 years of successful operation indicate that a very costly and cumbersome system of many plans would not be economically feasible — and, anyway, why not keep things simple.

Actually the Power Plant plan is quite simple and few records or computations are necessary beyond those required for good plant economy records. Sure, the computations are highly technical. The Engineer who makes them says that only God and he understand them, which seems diametrically opposed to the idea that an incentive plan must be so simple that an average employee can calculate his own bonus. The employees are not concerned with the engineer's computations. They understand that the nearer actual operation (heat consumption) approaches the theoretical "perfect" operation, for the existing conditions, the more coal is saved. As the saving in heat units increases, so does the percentage applied to each employee's base wage to arrive at his bonus.

Average Bonus Under 10 Per Cent

To be effective, the "bonus" does not need to be fabulous. The Power Plant plan is effective and the bonus average about 6 per cent of base wage. The average for the Company as a whole is under 10 per cent.

In our Electric Distribution Department we have 42 gain sharing plans with about 800 employees participating. The work measured by these plans includes such functions as meter installation, testing and repairing; overhead line and pole construction and maintenance; forestry work; underground construction and maintenance; Company and customer substation construction and maintenance; switching station and substation operation; station testing; voltage regulation; transformer testing; preparation of maps and records; trouble work; electrolysis surveys; street light and sign work. Here we really get scientific and time and motion analysis become more important. Timestudy men, skilled in splitting a simple operation into its elements; in "rating" performance and in distinguishing between necessary and unnecessary delays are essential.

Temperature Affects Bonus

To cite a real "toughie," the Overhead Line Construction and Maintenance incentive plan has 584 standard allowances. Believe it or not, the temperature of the day is a part of the bonus computation if it is substantially above or below a normal range, and abnormal or subnormal temperatures do affect the performance of the fellow on top of a pole.

Another overall incentive for a large group is the plan for operators at switching stations and substations. It is extremely simple. The principal function of the operators is to keep the load on parallel feeders balanced within limits; to shift load from one feeder to another; to tap an alternate source of supply if one goes out of service either by intent or in emergencies. That is perhaps an oversimplification of a very important job but the objective of the work is obviously continuous, uninterrupted service.

Station Operation Incentive Plan

We had an incentive plan for Station Operation years ago that was an engineer's nightmare. It had a book full of logarithmic curves for maintenance and operating costs on each piece of equipment, a dozen correction factors to adjust for every imaginable contingency and, as an incidental gadget, an "outage component" which rewarded operators for a reduction of outages. One day, after unsuccessfully trying to explain the thing to a very intelligent union steward, we scrapped the whole plan except the Outage Component and the plan has been fully as effective for many years. We simply allow a reasonable number of outages due to man failures and a reasonable number of outages due to equipment failures (a measure of proper maintenance) both based upon past experience and upon the number of lines and feeders on the system.

For example, on man failures we currently allow one outage per year on the 132 kv system; 14 for 66 kv, 26.4 kv and 13 kv systems combined; 14 for 4-5 kv, etc. A price is put on each type of outage. If the Operators avoid that one, very important 132 kv outage an amount of $134.50 per month goes into the "kitty." If the outage occurs because some Operator messes up his switching sequence the Operators, as a group, lose $134.50 per month for 12 long months. (Imagine the popularity of the Operator who causes an outage which costs the group $1,614.) Similarly a 66 kv outage has a price tag of $101, etc.

How Employees Share Bonus

It is the old Chinese idea of paying a doctor to keep us from being sick. The employees know that the group will share in the assigned value of every allowed outage that does not occur. The result has been a remarkable record of service continuity (except, of course, for non-chargeable causes such as interruptions due to storms and external causes) and a big pot of money for the employees. How do they share? Each month one-twelfth of the pot divided by the twelve-month average payroll determines the percentage applied to each man's pay-check.

The Accounting and Treasury Departments have 59 gain sharing plans with 165 employees participating. Here the average number of employees per plan is below 3 and the effectiveness of the incentives reaches its highest point. The work is highly specialized and repetitive so that it can be measured accurately on an individual basis. Meter reading, figuring, key punching, IBM machine operation, addressographing, cashiering, cash posting, credit, collection, typing, filing and many similar functions are measured as to quantity and quality.

Lowest Customer Accounting Cost

Susie gets a bonus on her own output, regardless of what anyone else does or does not do. This is the Industrial Engineer's heaven. He can split gnat's eyelashes to his heart's content. He can micro-motion study and micro-time study and dream about clerks being taught to use their feet, etc., instead of just ordinary hands. The girls really carry home the bacon but what do we care so long as FPC figures show that our Customer Accounting cost is one of the lowest, if not the lowest, published figure in the country.

The remaining plans are applicable to such groups as Major Appliance Servicemen, Small Appliance Repairmen, Sales people, Storekeepers, Purchasing Clerks, Printing Department, Chemical Laboratory and, believe it or not, the clerks who keep track of all that performance and calculate the bonus. The Shoemaker's kids finally got shoes.

With the exception of those large group plans such as Power Plant, Station Operation and the few sales plans, the performance is primarily measured against time allowances. Quality is controlled wherever feasible. In other words, the number of times each operation is satisfactorily performed is multiplied by the proper standard allowance. The sum of all individual operation allowances for a month, including travel, general overhead, weather factor, etc., where applicable, constitutes the total standard or allowed time. The actual time consumed by the work, subtracted from the standard time gives the saving or "gain" which is shared in accordance with a time-hallowed formula. The employees share or "Net Gain" in hours, divided by actual time, produces a percentage which, applied to wages, gives a bonus in dollars.

Group Plans

The plan which measures individual performance is, of course, the most effective incentive. Large group plans such as those covering Power Plant operation and Switching Station operation should be used only when accurate measurement of individual or small group performance is impossible or, for some reason, undesirable. The group plan has one definite advantage which tends to compensate somewhat for the diminished and less direct incentive for superior performance. It calls for cooperation between employees because they all share in results of their combined effort. A second advantage of the group plan is, of course, that it can be applied to a much greater number of operations than individual plans and thereby provides broader and more rapid coverage. The group plan is the logical starting point for those who are considering the introduction of incentives.

In general, supervisors closely related to the work, and some employees whose work can directly affect production, receive the average bonus of groups to which they are attached. For example, the supervisor over a group of meter testers, or typists; the Line Gang Foreman; the Plant Watch Engineer, etc., are paid a bonus based upon the percentage applicable to wages of those under their supervision. Obviously, the employees who maintain generating station equipment can affect the station's efficiency and they participate in the bonus.

Company General Bonus

And now—our sin. We have 385 employees whose performance we have failed to measure and whose work is not sufficiently related to any particular group to justify paying a group average bonus. Most of the engineering work; the development and research; the general accounting, building maintenance, etc., have thus far refused to be harnessed. These employees receive a bonus payment known as "Company General Bonus" which is a modified average of

all the measured bonus. It has little if any incentive in it and is frankly a payment, granted years ago, to reduce the probability that these employees will demand the impossible, namely, a plan to measure their performance.

We could, of course, fill a book with examples of how the several plans operate. The trouble is that with a third of a century behind you, the really spectacular illustrations occurred when the fellow who just retired on pension was a young meter reader.

Incentive Plan Objectives

Among the direct objectives of incentive plans are, of course:

1. Increased production and accompanying reduction in unit costs.
2. Reduction in errors in both manual and non-manual work.
3. Improved morale wherever such job characteristics as "monotony" are overcome by an incentive to produce more or where the incentive stimulates individual inventiveness or energies to more than average production and pay.
4. Improved check on the effectiveness of supervisors in charge of measured work.
5. Assistance in adjusting working forces up or down with substantial fluctuations in available work.
6. Economy in the use of materials and supplies, the principal item being coal.

The results of wage incentives also have supplemental and subsidiary uses; many of them valuable; some just interesting.

Reliable Performance Figures

As a current example of using an incentive plan twice, consider the predicament many of us are in with people on our payrolls who were employed on a labor market which provided little choice. You either committed violence to selection and interview results and took Sally anyway, or you had a vacancy. The number and quality of applicants is rapidly improving and when you replace Sally with a competent girl there is a comfortable feeling in having reliable performance figures in the form of individual production records and bonus payments, especially when the Union Business Agent wants to know, "What the hell's going on around here?"

Such records are very useful in selecting employees for promotion; in transferring employees to other work, in preparing budgets; in estimating costs; in determining whether or not it's worth while to change equipment. Will a proposed change in storeroom lay-out pay off; will a new type of wire, connector or insulator save money? Will an electric typewriter produce as much additional work as the salesman stated? What effect will wired music have on quantity of production? (It did not affect it either way.) Why does the Company have a rule against married women continuing employment? (Because of a sufficient number of cases where production records show that output nose-dived just before marriage and never regained the former level.) Does air-conditioning improve production? (It sure does.) How about light and acoustical treatment? (Both improved lighting and sound reduction brought lasting improvement in output and quality performance).

Selection Tests and Incentives

There is a substantial degree of correlation between the performance predicted by selection tests and the actual records of performance under the incentive plans—except that we found that some people have too much intelligence to be good producers on some types of work.

Another interesting angle of incentives, where quantity of production is one objective, is that the number of errors almost invariably diminishes as the number of units completed increases. This contradicts statements frequently heard that incentives produce quantity at the sacrifice of quality or safety. What actually happens is simple, In order to produce more work, in a given time, the employee must concentrate on what he or she is doing and closer attention to what they are doing naturally eliminates errors, whether they be clerical errors or industrial accidents.

We have not done all we can with production incentives at Wisconsin Electric Power Company. Although I believe that we are still the only utility which has gone into incentives on a large scale, there are places where we have failed to find a suitable basis for constructing incentives and some instances in which we thought we had it but finally had to abandon plans which proved unsound or unfair. There is still much to be done.

Once in a while an employee beats us out of money by the way work is reported—in spite of many controls established. However, at least 9 out of 10 are honest and with no incentives they can all beat you, if they want to, only you won't know it.

Yes, incentive plans are another potential source of employee grievances, but they are not numerous and, if the plan is fair and subject to explanation, the grievance does more good than harm because it provides an opportunity for bringing about a better understanding of the plans and their objectives.

Union Bonus Committee

What about your Labor Unions? Well, we have four of them and every incentive plan and amendment thereto is discussed with and approved by their representatives. We develop the standards but each Union has a "Bonus Committee" made up of men familiar with the plans. Of course, if a Union happens to be among those which unswervingly advocate more pay for less work the use of incentives would probably take some selling. In most instances the opposition of Unions to wage incentives is based upon misunderstandings and a conviction that the dishonest manipulation of some incentive systems in the past is still the employer's objective. There is one thing about incentive plans that no Union can argue down. Even during times when no Union would have the temerity to ask for a wage increase—even during a severe depression—employee wage earnings can be increased above base wage rates by whatever bonus their improved performance produces.

Administrative Responsibility

In Wisconsin Electric Power Company the development and administration of the incentive plans is part of the responsibilities of the Personnel Services Department which has other functions including employment, selection, training, safety, pension administration, job evaluation, industrial engineering, and a part in union negotiations. There is a close relationship between the incentive plans and several of the other functions enumerated.

Unfortunately there has been a lot of hocus pocus spoken and written about production incentives. Many papers on the subject by Industrial Engineers and a lot of the sales talks by the fellow who can "cut your working force 30 per cent" are so highly confusing and pseudo-technical that many interested

(*Continued on page* 432)

Wisconsin Celebrates 25 Years of Farm Electrification at Connection of 100,000th Farm

An important event in the history of farm electrification, the connection of Wisconsin's 100,000th farm customer, brought 400 guests to the public square in Ripon, Wis., on November 8, where those participating in the celebration included not only the 100,000th farmer, Herman J. Leffel, but four of the first six farmers to be connected to the pioneering Ripon Experimental Line. Attending the celebration were also such notables as Wisconsin's governor, Oscar Rennebohm, Curtis Hatch, president of the Wisconsin Farm Bureau Federation, J. W. Coverdale, first chairman of the National Committee on the Relationship of Electricity to Agriculture, and Professor F. W. Duffee of the University of Wisconsin College of Agriculture, director of the first experimental line.

State-wide Radio Broadcast

Highlighting the all-day program, which also commemorated the 25th anniversary of the establishment of the Ripon Experimental Line, a state-wide radio hook-up broadcast interviews with Mr. Leffel, the first Ripon line farmers who had witnessed the beginnings of organized farm electrification research in Wisconsin and the nephew of the owner of the first Wisconsin farm served by electricity in 1898.

Speakers at the dual celebration, in addition to Gov. Rennebohm, Mr. Hatch, Mr. Coverdale and Prof. Duffee, were: Grover C. Neff, president, Wisconsin Power and Light Co.; G. W. Van Derzee, president, Wisconsin Electric Power Co.; Charles E. Kohlhepp, president, Wisconsin Public Service Corp., and Clark G. Kuebler, president of Ripon College, where the addresses were given.

Leading off the formal program in the afternoon of Nov. 8, Gov. Rennebohm pointed out that Wisconsin has become the dairyland of the nation largely because farmers and processors of daily products have used electric service efficiently and abundantly.

"Farm folk use more electricity than city residents," he continued. "Official records of the Public Service Commission of Wisconsin show that the average annual use by rural customers during 1948 was 2664 kwhr. This consumption is 854 kwhr more than was used by city residential customers.

"As Governor of Wisconsin and as a farmer, I commend the various suppliers of electric service for their outstanding achievement in making electricity available to 97 per cent of all the workable farms in the State. I hope we will soon celebrate the 100 per cent saturation point."

Gov. Rennebohm Commends Pioneering Electric Companies

The Governor also commended the pioneering electric companies who procured the aid of farmers on the Ripon Experimental Line, the fifteen Electro-Test farmers, the College of Agriculture of the University of Wisconsin, the Wisconsin Farm Bureau Federation, the State Department of Agriculture, the Public Service Commission and equipment manufacturers for establishing the organized research program in 1924. "This valuable experimental work," he said, "a basic achievement in fundamental research, told electric companies and farmers that farm electrification would be mutually profitable and induced manufacturers to develop present-day equipment.

"The entire achievement of the electric industry," the Governor concluded, "is another brilliant chapter of accomplishment under our free opportunity system."

Grover C. Neff, first secretary of the Committee on the Relationship of

Governor Rennebohm of Wisconsin (left) and C. E. Kohlhepp (right), President, Wisconsin Public Service Corporation, congratulate Mr. and Mrs. Herman J. Leffel, owners of Wisconsin's 100,000th farm connected to rural electric lines, on being presented with a modern electric refrigerator. The ceremonies were held at Ripon, Wisconsin on November 8.

G. C. Neff, President, Wisconsin Power and Light Co., addresses a state-wide radio audience at the ceremonies for the connection of the 100,000th Wisconsin farm. He was followed by Prof. F. W. Duffee (left), of the University of Wisconsin.

Mr. and Mrs. Leffel (left) receive a certificate as owners of the 100,000th Wisconsin farm connected to rural electric lines, from C. E. Kohlhepp as Mr. Frank Roberts, whose uncle owned the first electrified farm in Wisconsin, looks on.

Electricity to Agriculture, outlined the early steps taken by the electric companies to bring electricity to the farms of Wisconsin.

"The electric companies of Wisconsin 25 years ago realized that some experimental and research work would have to be done to put electric service to work on the farms of Wisconsin in the best possible way, and at the least cost and with the greatest practical benefit to the farmers. Accordingly, in 1924, the Wisconsin Power and Light Company decided to build an experimental line to six farmers living south of Ripon," Mr. Neff said. "Therefore, the Wisconsin Utilities Association and the University of Wisconsin entered into a contract whereby the University would conduct and supervise experiments with the farmers on the Ripon Experimental Line."

"All this experimentation has undoubtedly saved the farmers of Wisconsin many serious mistakes and a great deal of money," Mr. Neff asserted, "but in order to permit as many farmers as possible to see with their own eyes that the experiments proved that electricity could be used profitably, the Ripon Line experiments were repeated on 15 other farms in the state.

"Since 1924," he concluded, "many thousands of miles of farm line have been built in Wisconsin, and today more than 95 per cent of Wisconsin farms have electric service available. More than 100,000 farms in the state are served by electric companies, more than 57,000 by cooperatives, and more than 8000 by municipal utilities. This huge development really began in an organized way here on the Ripon Experimental Line."

John W. Coverdale, who in 1923 was the first chairman of the National Committee on the Relationship of Electricity to Agriculture, emphasized the role of the business-managed electric companies in the 25-year development of farm electrification in the United States.

"Since the REA co-ops were not organized until after 1936, most of the research work and early cooperative work that was so important to this farm electrification development was done before they started. Therefore the electric operating companies, not the REA co-ops, are the ones that took an active part and contributed so much to the development of farm electrification in the pioneering days of the 1920's. Nevertheless, the early work done by the National Committees, and the research work conducted by the agricultural colleges, manufacturers and others, is of just as much value to the co-ops as it is to the operating companies. The advance made in learning how to electrify farms before 1936 has helped to speed up the serving of farms by cooperatives in the same manner as they have helped to serve the farm customers of electric operating companies. The work done here at Ripon and on similar lines in other states was of fundamental and basic value to farm users all over the United States, regardless of who furnished the electric service."

Mr. Coverdale was Executive Secretary of the Farm Bureau Federation when that organization and the National Electric Light Association formed the Committee on the Relationship of Electricity to Agriculture in 1923. In sketching the early history of the CREA Mr. Coverdale said:

"At the time we started this research work, only a very few farmers had electric service. Today 85 per cent of the occupied farms in the nation have electric service, and it is available to about 90 per cent.

"I know of no other development of this magnitude that was accomplished in such a short time and in such a satisfactory manner, and I want to repeat that the early cooperative work of the electric operating companies, the farm organizations, and other deserves a great deal of credit for this accomplishment."

Professor F. W. Duffee, chairman of the Department of Agricultural Engineering at the University of Wisconsin, and director of the early Ripon Line experiments, reviewed the progress made in the uses of electricity on the farm in the past 25 years.

"From a survey made in 1923," Professor Duffee said, "I find that of the farms having electric service, 62 per cent used electric irons, 50 per cent used electric washing machines, 37 per cent used electricity for pumping water, and 19 per cent operated milking machines with electric motors. There were only a few other household and farm appliances reported for those days, and their use was extremely small.

In contrast, Prof. Duffee pointed out that today "practically 100 per cent of electrified farms in Wisconsin now have electric irons, washers and water pumps, and a very high percentage operate milking machines with electric motors.

"Practically unknown on farms in 1924 were such things as refrigerators, freezers, vacuum cleaners, toasters, water heaters, and electric ranges," Prof. Duffee continued, although they are electric "uses that contribute to better farm living" that are now in rather general use.

"Barn cleaners, silo unloaders, dairy

(*Continued on page* 431)

Care of Insulating Oils for Electrical Equipment

By E. F. Walsh

Narragansett Electric Company, Providence, R. I.

A paper presented at the Forty-ninth meeting of the Electrical Equipment Committee, Schenectady, N. Y., Ocober 3 and 4, 1949

RELIABLE operation of electrical equipment with a minimum of maintenance is the object of all public utility companies. Whether or not this can be accomplished depends considerably on the proper maintenance of the insulating oil.

Tests for Insulating Oil

In past years and at present many companies give only secondary consideration to the condition of insulating oil in electrical equipment. The usual procedure is to test the oil for dielectric strength and possibly acid number. If both of these values are reasonable according to predetermined standards, the oil is considered satisfactory and no further thought is given to the oil until the oil temperature rises above normal or a failure occurs.

Actually, this sort of maintenance control is of little value. The dielectric strength test will indicate the presence of free water only. The acid number, that the oil has reached, or will reach at some future date, the point of deterioration where sludge has deposited.

The fact that an oil may begin to sludge at a neutralization or acid number as low as 0.10 mg KOH/gram of oil discounts the value of this test. There is nothing quantitative about either of the two tests mentioned yet they are the common basis for most decisions when the condition of an insulating oil is discussed.

Insulating oil is used primarily in a transformer to conduct the core heat losses to the surrounding cooling medium. To do this efficiently it must not cause compounds to be deposited that will plug oil passages and retard the heat flow.

The need for a test or tests which will give an indication of oil deterioration before sludge or other deposits have formed, has been a subject of investigation for many years. Of the many tests developed to date, power factor and interfacial-tension appear to be the most promising as a guide to deterioration.

The power factor test is based on the assumption that all dielectrics have some loss, and the measurement of the power factor of an oil, therefore, is a measure of this loss. It was found that the power factor of an insulating oil is a measure not only of contaminants such as oxidation products, asphalts, bushing compounds and other oil soluble contaminants, but also of the moisture present.

Products of oxidation do not appear to have a marked effect on the power factor value of an oil during the early stages of deterioration, therefore, the test is not sufficiently sensitive from this angle. It will, however, indicate the presence of bushing compounds, dissolved insulating varnishes and moisture.

Interfacial-Tension Test

The interfacial-tension test has been used experimentally for many years, but not until simplified measuring equipment became available a few years ago, was the test considered a practical one. Interfacial-tension is a function of certain molecular groups present in an oil and bears a relation to its emulsifying tendencies. The polar molecules such as soaps and acids which form in the oil due to deterioration, concentrate at the oil-water interface and orient themselves with the carboxyl groups toward the water phase. In the early stages of oil oxidation, these impurities begin to form in minute quantities. Because these impurities concentrate at the oil-water interface, the logical procedure would be to determine the interfacial-tension of the two liquids.

It appeared that if these data were correlated with a factor significant of oil quality, a term could be devised that could be used directly to predict the condition of an insulating oil. This term could be further developed to be the composite of two or more tests, leaving the responsibility of interpretation to those familiar with the limitation of the various test values.

The term selected for this concept was "quality factor" having a range of 0 to 100, zero being oil no longer serviceable and 100 being oil in excellent condition. The first correlation attempted was with neutralization number and interfacial-tension with quality factor. Several hundred samples of oil were analyzed from equipment in which the physical conditions were known. The purpose of this correlation was to determine if possible the value of neutralization number in predicting the condition of an insulating oil (See Fig. 1).

If we assume that interfacial-tension indicates contaminants such as soaps and acids, etc., as investigations to date imply, this graph (Fig. 1) shows that neutralization number is of little value in determining the condition or the progress of deterioration of an insulating oil until it has about reached or has reached the sludging stage.

A similar correlation was made with power factor, interfacial-tension and quality factor (See Fig. 2). This correlation indicates that in general there is no appreciable increase in power factor value with decrease in oil quality in the quality factor range from 40 to 100. Oils having a quality factor value of less than 40 may have a power factor of almost any value. It was found that with oils known not to have reached a sludging condition, a good correlation between power factor and quality factor is obtainable after filtering the oil to remove free moisture (above the saturation value of oil at the temperature at time of filtration).

This indicated that power factor is a measure of the moisture present in a serviceable insulating oil.

Dielectric Test

The dielectric test as now used to indicate moisture in oil is not entirely satisfactory and is the subject of much controversy. Whereas the dielectric test indicates the condition of that portion of the sample between the discs, the power factor measures the average of the entire sample.

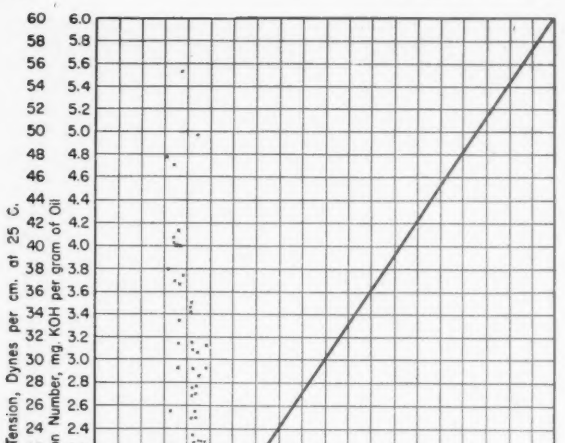


Fig. 1—Relation of Neutralization Number to Interfacial Tension Value versus Quality Factor.

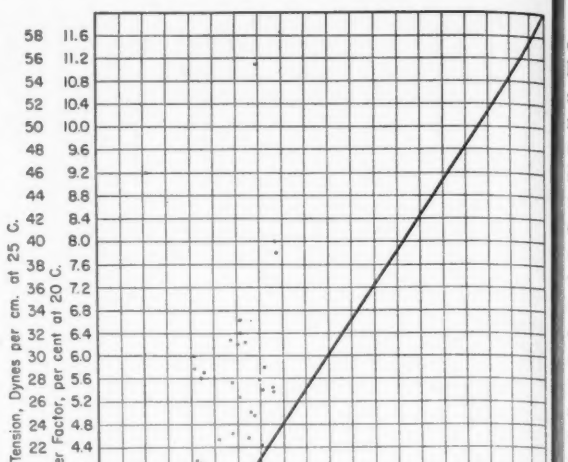


Fig. 2—Relation of Power Factor to Interfacial Tension Value versus Quality Factor.

It is recognized that the presence of moisture in insulating oil is undesirable for several reasons. Most oxidation products as they form, are soluble in water, and the water then becomes acidic and is absorbed by the insulation resulting in lowering its dielectric strength. The presence of water in oil also acts as a catalyst in the presence of copper and iron to form metallic soaps, thus accelerating oxidation.

It is to our advantage to maintain insulating oil as free from moisture as is practical. Insulating oil can hold in solution, or finely divided in suspension, from 15 to 300 ppm of water, the amount depending upon the stage of deterioration. Thus we find that the moisture content of an oil is related to oil quality.

From these data presented, an experimental graph was made (See Fig. 3) involving two factors, namely, interfacial-tension and power factor, to predict the quality or condition of an insulating oil.

The procedure is to determine the interfacial-tension value and power factor of the oil in question. Reference is then made to the graph and the quality factor determined. The quality factor in this case does not include the moisture content in the oil, so it is necessary to know the power factor value of the oil. In developing the graphs it was found that, from case histories, oil having a quality factor below 34 had a sludging tendency, and that, as previously mentioned, power factor values increased with the moisture content of the oil.

The following rules were decided upon for the trial period to indicate the quality of an oil:

1. If the quality factor is above 34 and the power factor is less than 2 per cent, the insulating oil can be considered satisfactory for continued use.
2. If the quality factor is above 34 and the power factor is 2 per cent or greater, the oil should be filtered or centrifuged. The oil will then be satisfactory for continued use.
3. If the quality factor is less than 34, the oil has deteriorated to a point where sludge or varnish is likely to deposit on transformer core and windings. Oil in this condition cannot be corrected by filtering and should be changed or reconditioned.

After analyzing the results of over 8,000 insulating oil samples, a nomograph (See Fig. 4) was developed in which the interfacial-tension and power

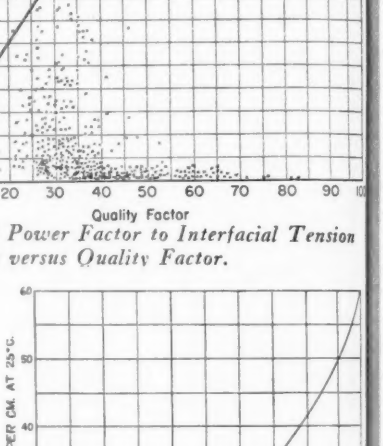


Fig. 3—Determination of Quality Factor.

factor values (on as-received samples were used to determine the quality factor. The power factor determination is used as a measure of the moisture and other contaminants not indicated by the interfacial-tension test. This nomograph has been checked by actual field observations and found to be a reliable index as to oil condition. Its use at present is limited, however, to determining the oil quality from laboratory analyses. Field equipment for determining power factor with the necessary accuracy is not yet available.

Equipment to recondition insulating oils in transformers and oil circuit breakers without removing them from service has been urgently needed. In many cases where oil has deteriorated to the extent of sludging, or approaching a sludging condition, field reconditioning would be an advantage. This could be done under normal load conditions, thus making equipment available which would normally be required to be removed from service for cleaning and oil replacement. In many cases the life of transformers could be extended by this procedure. This would be brought about by eliminating the necessity of transporting the equipment to the maintenance building and removing the core for washing and cleaning which occasionally causes damage to the insulation.

Centrifuge and blotter press treatments will remove insoluble sludges and free water from oil, but will not prevent a reoccurrence of sludge deposits. Neither of these treatments will condition the oil to a point where it will have a solvent action to remove the sludge deposits on the core and windings.

In order to eliminate the cause of sludging, it is necessary to remove contaminants such as polar compounds which are soluble in the oil. Such contaminants can only be removed from an oil by an absorbent material such as activated clay.

Insulating oil can be satisfactorily reconditioned by the bath treatment, by mixing clay with the oil and then removing the clay by filtration. The clay percolation method is also satisfactory. These processes in themselves are relatively inexpensive but they require the removal of the oil from the equipment, and in many cases it is necessary to transport the equipment or oil over long distances.

Many attempts have been made to design portable continuous filtering equipment employing the efficient activated clays. The major difficulty has been "packing" of the earth in the filters, requiring extremely high pressures to force the oil through the earth bed. Another difficulty has been channeling which is indirectly the result of earth packing and high oil pressures.

The equipment we are presently using employs fuller's earth as a filtering medium. This unit has a self-contained pump and automatic oil temperature control and can be adjusted for operating pressures up to 60 psi. The filtering capacity is 75 gallons per hour per unit.

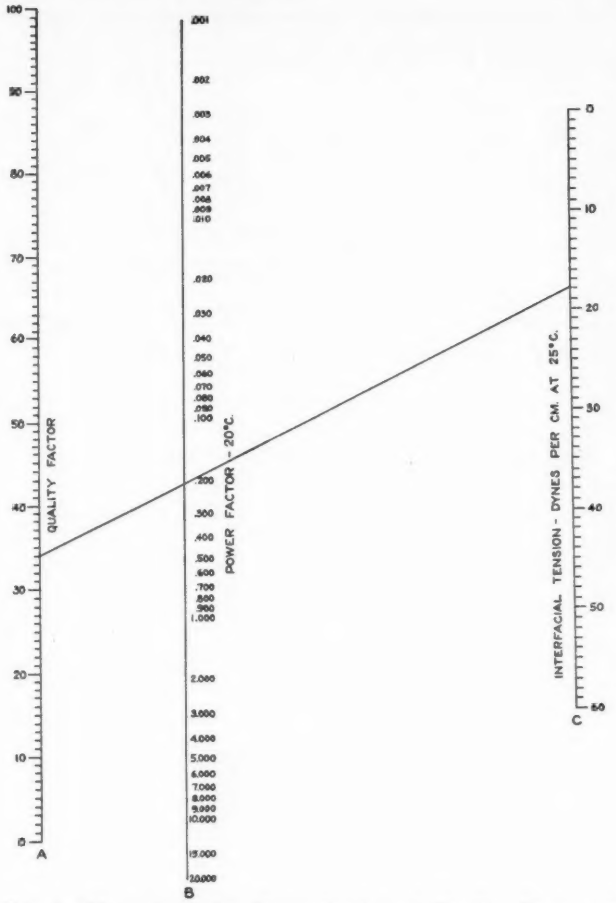


Fig. 4—Nomograph for Determination of Quality Factor of Insulating Oil.

1. Determine Interfacial Tension value of oil.
2. Determine Power Factor value of oil.
3. Find Interfacial Tension value of oil on Scale C.
4. Find Power Factor Value of Oil on Scale B.
5. Connect points B and C in straight line to intersect Scale A.
6. Find Quality Factor at Intersection on Scale A.

If the Interfacial Tension value of the oil is above 18 dynes and the Quality Factor is below 34, the Quality Factor of the oil can probably be improved to a value above 34 by filtration with a blotter press. If this operation does not improve the oil, then it should be filtered through Fullers Earth. Insulating oils having an Interfacial Tension value above 18 dynes and a Quality Factor below 34 probably are contaminated with insulating varnish, moisture or sodium silicate.

If a transformer is known to have sodium silicate treated iron and the Quality Factor is below 34, it should be processed with Fullers Earth. Blotter press filtration of the oil will not correct its condition.

Laboratory experiments with the equipment were satisfactory and our initial trial in the field was on a 11/22-kv transformer having an oil capacity of 2460 gallons. The suction line of the filter was connected to the drain on the bottom of the transformer case, and the discharge to the conservator tank. The earth capacity of the filter is 150 lb.

The unit was placed in service on a transformer under normal load conditions. The oil was circulated for 72 hours through the first charge of fuller's earth. This operation raised the quality factor from 24 to 50. The fuller's earth charge was then replaced and the oil again circulated for 72 hours. The quality factor in this operation was raised from 50 to 60. A third change of fuller's earth increased the quality factor to 64. The analysis of the oil before and after treatment was as follows:

	Before Treatment	After Treatment with 450 lb. Fuller's Earth
Neutralization No. (Mg. KOH/gr. oil)	0.58	0.32
Power Factor (Per cent at 20 C.)	0.37	0.04
Interfacial-tension (Dynes/cm at 25 C.)	15.60	31.70
Quality Factor (Per cent)	24.00	64.0
Dielectric Strength (Kv).	33	33

It should be recognized that a transformer so treated in the field will not be sludge free although the oil after treatment will be in a satisfactory condition chemically. Insulating oil having

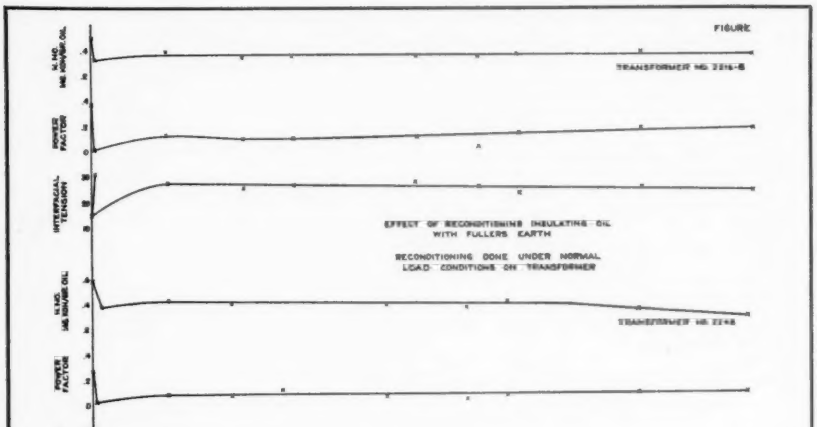


FIGURE
TRANSFORMER NO. 2216-B
EFFECT OF RECONDITIONING INSULATING OIL WITH FULLERS EARTH
RECONDITIONING DONE UNDER NORMAL LOAD CONDITIONS ON TRANSFORMER
TRANSFORMER NO. 2242
AFTER RECONDITIONING WITH 63 LB. FULLERS EARTH PER GALLON OF OIL
BEFORE RECONDITIONING
THOUSANDS OF OPERATING HOURS

Fig. 5—Graph of Effect of Fuller's Earth Treatment On Insulating Oil In Two Transformers.

an interfacial-tension value of 32 dynes will dissolve the sludge deposited on the windings and cause further deterioration of the oil. The extent of this deterioration will depend upon the amount of sludge present. In cases where appreciable sludge deposits exist, it may be necessary to repeat the treatment within a year. After removal of all sludge deposits, the oil should give satisfactory service for at least 10 years. Fig. 5 shows the effect of fuller's earth treatment on insulating oil in two transformers under load and the rate of oil deterioration with time.

Three transformers having sodium-silicate-treated iron were next selected for test. The oil in these transformers had high power factor values, low neutralization number and interfacial-tension values. This combination of values is significant of transformers containing silica-treated iron. Although the manufacturer of the transformers stated that power factor values are of little value if referred to oil contaminated by sodium silicate, the fact remains that sodium silicate could not become dissolved in the oil unless the oil had first oxidized; therefore the oil must be in a deteriorated condition as indicated by the power factor value.

The first sodium-silicate-treated iron transformer in which the insulating oil was reconditioned under load had a power factor value of 7.9 per cent and a quality factor value of 36. The oil capacity of the unit was 810 gallons. No outages were required to install or dismantle the filtering equipment. The results obtained were as follows:

	Before Treatment	After Treatment 3½ hrs.	28 hrs.	48 hrs.
Neutralization No. (Mg KOH/gr. oil)	0.11	.09	.09	.09
Power Factor (Per cent at 20 C.)	7.90	3.14	.024	.02
Interfacial-tension (Dynes/cm at 25 C.)	19.10	25.50	32.80	32.80
Quality Factor (Per cent)	36	52	66	66

For the above treatment, 140 lb of fuller's earth was required, which was valued at $11.75, making the cost of material equal to 1.45 cents per gallon of oil. Analysis of the oil following the treatment described indicated that all of the sodium silicate which had become dissolved in the oil in any form had been removed. The treatment in this case was successful and resulted in a substantial saving over conventional maintenance methods.

The significance of the interfacial-tension test in following the deterioration of an insulating oil can best be illustrated by referring to Fig. 6. This group of curves illustrates three insulating oils which were installed in three transformers. In each case, the accelerated oxidation life test on the oil has been plotted, also the actual service life to date. The points indicate the precision with which the interfacial-tension value can be determined, plotted and the probable time at which sludge may be expected to form (Interfacial-tension value of 18 dynes/cm).

The three transformers on which these tests are being conducted are at least 25 years old. The original oil in each case was removed because of a sludge condition or transformer failure. The core and shell at each transformer was flushed with the replacement oil and a new batch of oil installed. The expected life of the new batches of oil will be somewhat less than if new transformers were used. The transformers are on 11/66-kv service (conservator type) and have a capacity of 20,000 kva.

A similar life expectancy graph cannot be made by using any known tests other than the interfacial-tension test. Graphs of this type make possible scheduled maintenance and inspection

(*Continued on page* 428)

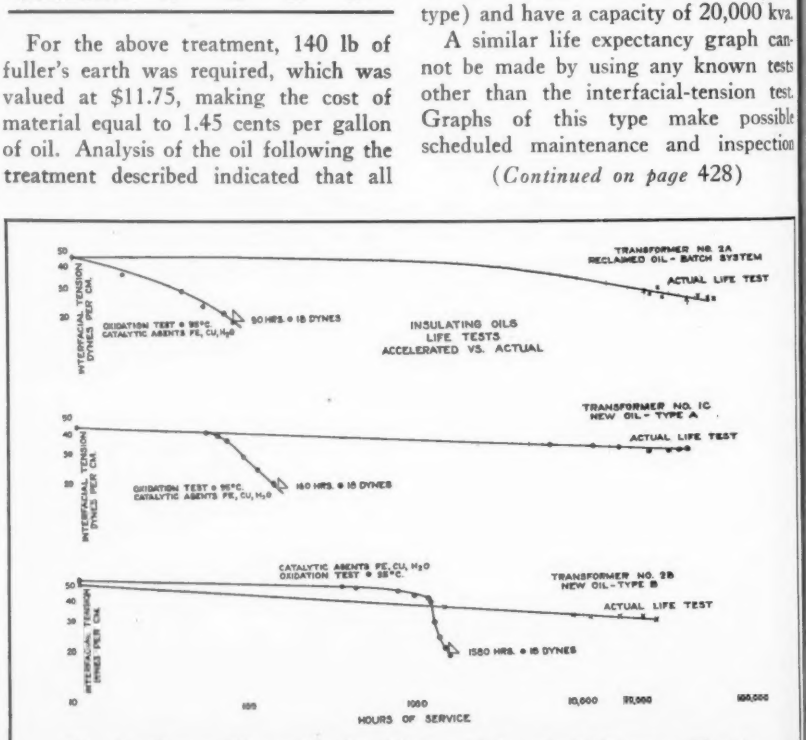


Fig. 6—Curves Illustrating Significance of Interfacial-Tension Test in Determining Deterioration of Insulating Oil of Three Transformers.

Impact of Taxation on Public Utilities

By C. E. Eble

Controller, Consolidated Edison Company of N. Y., Inc.

An address before the Utility Industry Conference at the Annual Meeting of the Controllers Institute, San Francisco, Calif., September 28, 1949

THERE has been a great deal of discussion and study devoted to this subject concerning the general effects of taxation. It is a coincidence that I have been working with a committee of another association which has had under consideration this very subject in its particular relation to utility financing.

I am dividing the subject matter of our discussion into four general fields.

1. In the financial field much has been said about the scarcity of equity capital and the underlying reasons therefor. How much of this scarcity is due to the impact of taxation; and, the extent to which public utilities may feel the brunt of this condition more than other industries is one of the points that we shall consider.
2. Another field which we can discuss to advantage has to do with the meaning of so-called "double taxation" of corporations. What is this subject all about and what are its peculiarities in the utility field?
3. Perhaps the most important tax effect, however, to utilities has to do with equality of taxation or rather the *lack of equality*. Certainly, any discussion in the utility field having to do with the impact of taxation must include this fruitful field for study.
4. Last but not least, one cannot lose sight of the unwholesome, uneconomic and discriminatory taxes which are imposed on utilities and their customers.

With these four fields in mind, let us proceed with our discussion.

Scarcity of Equity Capital

The volume of plant construction for industry in general, during the post war period, has been unprecedented. American business spent over $16 billion for plant and equipment in 1947 and over $19 billion during 1948. The Department of Commerce estimate for the 1949 volume of construction is $18½ billion. This expansion has been financed to a large extent through Retained Earnings (including depreciation, depletion, and other income reservations); to a lesser degree by the sale of Debt Securities (including debentures and bank loans); but, only to a minor extent through the sale of Preferred and Common Stock.

Taking the year 1948 alone, only 4.7 per cent was from stock issues, additional debt furnished 24.7 per cent while Retained Earnings, etc., furnished 70.6 per cent. For reference a chart has been prepared, Table I, showing the total requirements for plant construction for all industries, except agriculture, for the years 1939 to 1948 together with the sources from which the money was obtained. Table I also shows similar figures for the gas and electric industries alone.

There are several differences between the utility results and those of industry in general that are of interest. For example, most of the money requirements for these utilities were obtained through debt financing rather than from Retained Earnings particularly in recent years. In 1939, the utilities financed 91 per cent plus of their requirements from Retained Earnings while this dropped to a low of 21.5 per cent in 1948. During the same period debt financing rose

TABLE I—CAPITAL REQUIREMENTS AND SOURCES OF FUNDS FOR DOMESTIC BUSINESSES AND ELECTRIC AND GAS INDUSTRIES, 1939 TO 1948

	Domestic Businesses							Electric and Gas Companies						
	Capital Requirements (Largely Plant and Equipment)	Sources of Funds						Capital Requirements (Largely Plant and Equipment)	Sources of Funds					
		Internal Operations		External Financing					Internal Operations		External Financing			
		Retained Earnings, Depreciation, Other Accruals, etc		Debt		Capital Stock			Retained Earnings, Depreciation, Other Accruals, etc		Debt		Capital Stock	
	Amount	Amount	Ratio	Amount	Ratio	Amount	Ratio	Amount	Amount	Ratio	Amount	Ratio	Amount	Ratio
1939	4,577	4,193	91.6	287	6.3	97	2.1	480	440	91.7	34	7.1	6	1.2
1940	6,108	5,372	88.0	601	9.8	135	2.2	550	445	80.9	77	14.0	28	5.1
1941	7,676	6,614	86.2	889	11.6	173	2.2	710	613	86.3	71	10.0	26	3.7
1942	4,702	4,078	86.7	506	10.8	118	2.5	680	570	83.8	76	11.2	34	5.0
1943	3,761	3,385	90.0	284	7.6	92	2.4	540	518	95.9	20	3.7	2	.4
1944	5,348	4,696	87.8	428	8.0	224	4.2	490	450	91.8	17	3.5	23	4.7
1945	7,134	5,870	82.3	607	8.5	657	9.2	630	561	89.1	43	6.8	26	4.1
1946	12,393	8,837	71.3	2,084	16.8	1,472	11.9	1,040	785	75.5	112	10.8	143	13.7
1947	16,180	11,386	70.4	3,572	22.1	1,222	7.5	1,900	820	43.2	796	41.9	284	14.9
1948	19,230	13,572	70.6	4,748	24.7	910	4.7	2,680	576	21.5	1,727	64.4	377	14.1

Sources -
Survey of Current Business - U. S. Dept of Comm.
Federal Reserve Bulletins
The Economic Report of the President January 1949, July 1949
Commercial & Financial Chronicle
Economic Progress N. Y. S. E. October 1947

from 7.1 per cent to a high of 64.4 per cent. Of course the unparalleled construction expansion program in recent years within the utility industry required the obtainment of additional funds from sources other than internal operations. The financing of capital requirements through the flotation of common and preferred stocks uniformly appears low both for public utilities and general business. However, the trend in the public utility field shows increasingly larger financing from this source during the past several years.

Dangers of Indebtedness

The small amount of stock sales or so-called scarcity of equity capital has been a matter of concern to business leaders generally who urge the desirability of raising more of capital requirements through equity financing. All agree that additional indebtedness incurred to finance expansion can be inherently dangerous. The memories of the great depression are too recent, with its train of bankruptcy, foreclosures and receivership, to let any one forget that too much debt may well be the road to ruin.

Reducing individual income taxes may appear to be one of the obvious solutions for increasing the attractiveness of equity securities. But the large and pressing needs of the Federal Government under its present concept of administration preclude substantial tax reductions to individuals without alternative sources of revenue.

To the present time, to my knowledge, no acceptable substitutes for the present taxes on individual income have been developed. For this reason, the incentive to increase stock ownership must be within the present framework of corporate and individual taxes, and as a further condition, apparently there can be no reduction in the total amount of revenue raised.

Lack of Capital Formation

Two general propositions directed toward the lack of equity financing have been widely discussed. One is based on the theory advanced that the scarcity of equity financing was due largely to the lack of capital formation which in turn was caused by the impact of the heavy personal income tax rates in the higher brackets.

I do not wish to unduly burden you with figures but in order to emphasize this point, let me give you some idea as to the extent to which potential savings of individuals in recent years reverted to tax collector, Uncle Sam by making a comparison between the years 1929 and 1949 (after application of community property principle).

Annual Gross Income (Married Person)	Remainder After Taxes — 1929		Remainder After Taxes — 1949	
$5,000	$4,977	....	$4,370	87%
10,000	9,865	99%	8,400	84
50,000	45,355	91	32,800	66
100,000	84,395	84	53,600	54
500,000	384,435	77%	116,000	23%

It has been estimated that on annual incomes above $5,000, savings of 30 per cent to 50 per cent were realized in the pre-war period, whereas today income taxes take $8 billion out of a gross income of $29 billion for persons whose annual income exceeds $5,000 and that about 10 per cent remains for possible savings. The decline in the ability of the high income groups to save and use such savings in part, as heretofore, to invest in equity securities is obviously the result of large income personal taxes.

Estate and gift taxes also have an effect on the disposition of savings in that past accumulated savings were bequeathed intact to succeeding beneficiaries whereas with the present estate taxes ranging upward to 77 per cent there is little incentive offered nor is there the opportunity for large personal estates to pass from one generation to another without the consequent effect that the past savings are either dissipated through government expenditures or bequeathed to Foundations or other tax-exempt organizations.

Reducing Corporation Taxes

The second point I wish to make has to do with reducing or at least not increasing the present taxes on corporations. The dangers as a result of high or higher taxes on corporations are presently receiving nation-wide attention. It appears to be the consensus that any increases, if there are to be any, should be determined without unduly interfering with the prospects for continued business expansion and with assurance that profits, after taxes and dividends, will be sufficient for investments and contingencies.

I am personally not so sure that the dearth of equity capital can be traced to the tax burden alone, although admittedly it may be an important factor. It appears that the rate of return or the attractiveness of the earnings of common stock equities has more to do with this problem for the moment than the tax impact. This is particularly true in the public utility field. Also, there has been perhaps a mistaken idea as to the possible market area for equity securities.

It now appears that the greatest potential market for the sale of equity stocks is to the groups in the lower income tax brackets. No less an authority than Emil Schram, President of the New York Stock Exchange, has advanced the view that risk capital must now be obtained from those with average or less than average income. What is needed is a new approach to the real market for the sale of equity securities at this time, and the recognition that utilities must have adequate earnings in order that their common and preferred stock be made attractive.

"Double Taxation" as Applied to Public Utilities

What constitutes "double taxation" has been the subject matter of considerable debate. Double taxation in its full sense is very difficult to prove *in fact* as I shall attempt to explain.

The reason for this is that if a corporation's income taxes are reduced or eliminated, the result may mean greater dividends. On the other hand, these savings may be diverted to the payment of higher wages and salaries or toward the reduction of the selling price of the product. Therefore, it can readily be seen that taxing the income of a corporation and taxing the income of its stockholders to the extent of their dividends received may not constitute double taxation except in part. It also seems true that where the recipient of dividends from corporations is in the higher income tax brackets, the degree of possible duplication is considerably lessened.

Two Methods of Eliminating "Double Taxation"

Two methods for mitigating or eliminating "double taxation" most commonly referred to are as follows:

1. Allow the corporation a reduction for dividends from taxable income similar to the present bond interest deduction;
2. Allow the stockholder a tax exemption for dividends to the extent that the corporation has already paid taxes on the income

from which the dividends were paid.

Generally speaking to permit the corporation a tax deduction for dividends from taxable income may well lead to *increased* dividends. However, in the public utility field the granting by the Government of a "dividend paid credit" would undoubtedly result in such tax saving being passed on in time in the form of a reduction of the selling price of the product. As a regulatory requirement, utility companies are permitted to charge taxes as an operating expense or at least all such taxes are treated as a cost of the enterprise for rate making purposes. If we assume any relatively fixed concept as to what constitutes a rate of return, this would certainly be the case.

It may reasonably be concluded therefore that very little benefit would accrue to the utility companies income status should there be a permissive tax deduction on dividends paid. To the contrary, such consideration may prove harmful because under regulation such reduction of taxes, as I have just stated, would merely constitute in the final analysis a reduction in the rates for service while on the other hand causing a substantial loss to the *national* revenues. These losses would have to be made up from other tax sources from which utilities could hardly expect to be exempted.

The second method seems to assure the stockholder of a tax advantage and indirectly prove to be beneficial to corporations. For example if a credit were allowed to individuals for dividends received in computing their personal tax liability, it would make the ownership of common and preferred stock tremendously more attractive.

Suggests Gradual Exemption

That there is room for improvement in this double taxation field is self-evident. It is most gratifying to observe that some servants of the public interest are aware of the injustices attendant to this matter. Senator George, Chairman of the Senate Finance Committee in sponsoring relief on this matter stated that although the goal should be to exempt all dividends from double taxation, it would have to be a gradual process as the full impact would result in a loss to the Treasury Department of $2 billion annually. Senator O'Connor, Maryland, also is in agreement with the thoughts expressed by the Chairman of the Senate Finance Committee, stating that individual stockholders should be allowed a tax credit on dividends where the corporation paying the dividends already has paid taxes.

TABLE II—GROWTH OF TAX EXEMPT, PUBLICLY OWNED ELECTRIC UTILITIES, 1930-1948

Year	Total Capacity	Privately Owned		Publicly Owned (Largely Tax Exempt)							
				Total		Municipal		Federal		Other	
	(1000 KW)	Capacity	Ratio	Capacity	Ratio	Capacity	Ratio	Capacity	Ratio	Capacity	Ratio
1930	32,384	30,285	93.5	2,099	6.5	1,601	5.0	226	0.7	272	0.8
1939	38,863	33,908	87.3	4,955	12.7	2,807	7.2	1,650	4.2	498	1.3
1940	39,927	34,399	86.2	5,528	13.8	2,977	7.4	1,944	4.9	607	1.5
1941	42,405	36,041	85.0	6,364	15.0	3,158	7.4	2,371	5.6	835	2.0
1942	45,053	37,442	83.1	7,611	16.9	3,331	7.4	3,216	7.1	1,064	2.4
1943	47,951	39,128	81.6	8,823	18.4	3,419	7.1	4,322	9.0	1,082	2.3
1944	49,189	39,733	80.8	9,456	19.2	3,447	7.0	4,886	9.9	1,123	2.3
1945	50,111	40,307	80.4	9,804	19.6	3,586	7.2	5,081	10.1	1,137	2.3
1946	50,317	40,335	80.2	9,982	19.8	3,708	7.3	4,920	9.8	1,354	2.7
1947	52,322	41,986	80.2	10,336	19.8	3,826	7.3	5,027	9.6	1,483	2.9
1948	56,463	45,313	80.3	11,150	19.7	4,078	7.2	5,526	9.8	1,546	2.7

Source - Statistical Bulletin, E. E. I. Year 1948

Discrimination

There are two types of tax discrimination that have serious effects on public utilities. One lies in the security field and of course is therefore applicable in part to industry in general as well as public utilities. The other has to do with the tax treatment accorded governmental and municipally owned utilities and other forms of tax exempt enterprises that engage competitively with privately owned utilities. First, let us consider the situation in the investment field.

The individual investor is interested primarily in two things: income and appreciation of his investment. With respect to appreciation, the Internal Revenue Code does not discriminate between the forms of corporate securities. Both bonds and stocks are capital assets and their appreciation is taxed as capital gain. In the matter of income, the tax law discriminates at the corporate level between income applicable to stock and income applicable to bonds by taxing the former and exempting the latter as a deduction from gross income. As a result, the advantage to the corporation of bond issues over stock as a means of low-cost financing is accentuated.

The really important area of discrimination, however, in the tax field against public utilities involves the exemption of municipally and governmentally owned utilities from the payment of taxes and the tax exempt status of other enterprises which engage in the utility business. Until such enterprises are taxed on an even footing with the privately owned companies, there is an enormous advantage to those who do not contribute to the support of government.

Discrimination goes beyond the elimination of taxes on publicly owned utilities. The Federal Government also exempts state and municipal bonds from taxation. The results are that long term exempt state or municipal bonds are more attractive as an investment than utility securities, particularly to high income individuals. State and municipal power agencies are, therefore, in a position to float their securities at lower rates than can be obtained by the privately owned utilities.

The extent to which utilities in the electric field are owned by tax exempt organizations is shown in Table II. As Table II shows, in 1930, out of a total generating capacity in this country of 32 million kw, privately owned companies constituted 93.5 per cent while the tax exempt groups constituted only 6.5 per cent. In the year 1948, however, we find the privately owned groups constituting 80 per cent of the total capacity as against the tax exempt groups of nearly 20 per cent. The creation and growth of tax exempt enterprises undoubtedly represent the most serious of all the tax impacts insofar as public utilities are concerned.

Taxes Which Are Burdensome and Which Involve Unusual Administrative Difficulties

Among the public utilities and railroads, there are a number of excise taxes which are by their nature inequitable and which in some instances are very burdensome and costly on the companies to

(*Continued on page* 431)

Credit and Collection Experience of U. S. Gas and Electric Industries

Dollar Sales Show Increase for the Period January 1 to June 30, 1949

THE dollar sales continue to show a substantial increase for all sections of the country, according to the latest six-months' survey of credit and collection experience for gas and electric industries in the U. S., conducted by the Joint EEI-AGA Accounting Project Committee, H. D. Amann, Chairman.

Rate increases had less of an effect on the results than in the last report (EEI BULLETIN, May, 1949, p. 149); however, one large company in the Middle Atlantic area was subject to a rate decrease which adversely affected that area.

Number of Customers Gains

We continue to show a gain in the number of customers connected to company lines in all sections of the country, with the South and the West again setting the pace. (See Fig. 1.)

The outstanding has increased in all except the Middle Atlantic area where one large company increased its collection tempo in an effort to offset a rapid increase in net charge off.

The outstanding in per cent of sales indicates a downward movement in all sections except in the West South Central area which again exhibits an increase.

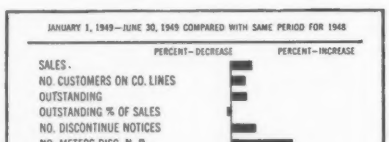


Fig. 1—Graph of Credit and Collection Experience of the U. S. Gas and Electric Industries.

Discontinue Notices Increase

The number of discontinue notices shows a greater increase than did the last report. This, no doubt, is due to the larger uncollectible bill figures reported in nearly all areas, and it reflects an attempt to reduce the charge off by a closer collection follow up.

The number of meters disconnected for non-payment increased for every section. This undesirable trend is indicative of the tighter money situation throughout the country.

Despite an increasing number of companies that are committed to the practice of reducing their deposit outstanding, there is an increase for the country as a whole. This upward trend is no doubt a result of efforts to guard against the increased losses which were experienced in nearly every section of the country. (See Fig. 2.)

General Increase In Accounts Charged O

Except for the Middle Atlantic and West North Central areas, there is a general increase in the number of accounts charged off; however, the increase is lower than that of the previous report for the country as a whole.

The net charge off is up in all areas except the West North Central. While the losses are still increasing the rate of increase is slightly less than that shown in the previous report. It would appear that the more stringent collection practices that have been instituted are beginning to show results.

(JANUARY 1, 1949—JUNE 30, 1949) • PERCENT—INCREASE OR DECREASE OVER CORRESPONDING PERIOD—1948

	NEW ENGLAND	MID-ATLANTIC	EAST NORTH CENTRAL	WEST NORTH CENTRAL	SOUTH ATLANTIC	EAST SOUTH CENTRAL	WEST SOUTH CENTRAL	MOUNTAIN STATES	PACIFIC STATES	UNITED STATES TOTALS
SALES	+5.3	+1.6	+6.5	+9.3	+10.3	+7.2	+3.7	+14.2	+9.8	+6.4
NO. CUSTOMERS ON CO. LINES	+2.6	+1.8	+2.2	+3.1	+7.5	+7.9	+6.4	+6.1	+6.4	+4.1
OUTSTANDING	+5.2	−1.1	+6.2	+3.1	+7.9	+7.2	+11.5	+7.0	+7.9	+4.7
OUTSTANDING % OF SALES	−0.1	−2.6	−0.2	−5.7	−2.3	a	+7.6	−6.3	−1.7	−1.6
NO. DISCONTINUE NOTICES	−6.1	+6.6	+24.7	−6.1	+4.7	−1.9	+5.3	−22.0	+25.8	+7.2
NO. METERS DISC. N. P.	+17.9	+8.4	+27.2	+36.9	+23.8	+19.8	+22.4	+49.8	+13.5	+16.2
DEPOSIT OUTSTANDING	+1.1	+6.1	−8.8	+6.7	+14.3	+8.6	+6.8	−0.1	+4.0	+6.4
NO. ACCOUNTS CHARGED OFF	+20.6	−4.1	+6.8	−13.8	+21.5	+38.0	+31.3	+44.0	+27.6	+13.0
NET CHARGE OFF	+17.9	+28.6	+25.1	−4.8	+40.9	+11.4	+37.0	+81.5	+22.1	+28.1

a less than .05 percent

Fig. 2—Reflection of the Credit and Collection Experience of the U. S. Gas and Electric Industries.

Six Contests to be Conducted by EEI Offer Awards for 1949 Achievements

SIX major prize contests will again be conducted by the Edison Electric Institute this year, offering prizes honoring individual and group achievements within the industry during 1949. Entries will be judged early in 1950, and the awards will be presented at either the 1950 Annual Convention or at the Annual Sales Conference.

Competition for the Charles A. Coffin Medal, emblematic of high achievement in the electric light and power industry, will be conducted under the new procedure inaugurated last year. Under this new procedure, five companies, chosen through a nomination and reviewing process, will be invited by the President of the Institute to compete for the Award. From these companies, the Charles A. Coffin Award Committee will establish the winning company, after careful evaluation of the data relating to the accomplishments of the companies under consideration.

Established by the General Electric Company and donated annually by the Charles A. Coffin Foundation, the Coffin Medal is the industry's most coveted recognition of merit. It is given each year to that company making "the greatest advancement in its operation and physical plant, thereby making a distinguished contribution to the development of electric light and power for the convenience of the public and the benefit of the industry." The Award consists of a gold medal for the winning company, and $1,000 for the company's employee benefit fund.

With the exception of the Coffin Award, administered by the Charles A. Coffin Award Committee, all prize contests sponsored by the Institute are under the jurisdiction of the Prize Awards Committee, headed by George E. Whitwell, Philadelphia Electric Company, Philadelphia, Pa. Four of the contests stress commercial activities, while the Claude L. Matthews Valor Award is given to honor acts of courage beyond the call of duty.

PLANNED LIGHTING AWARDS

This year will mark the second year of competition for the Planned Lighting Awards, first made available by the Better Light-Better Sight Bureau in 1948. Other awards for commercial activities are the George A. Hughes Awards, the Thomas W. Martin Award and the Laura McCall Awards.

The Better Light-Better Sight Bureau will offer $1,400 in prizes for winners of the Planned Lighting Awards for 1949. Three prizes of $150 each will be awarded in the field of commercial lighting, two $150 prizes will go to the winners in the field of residential lighting, while $150 will be awarded to the company with the best industrial lighting program. In addition, a grand prize of $500 and a bronze plaque will be awarded to the company with the best program in all three markets combined. In the separate categories, bronze plaques will go to the prize winning companies, while persons responsible for the specified fields will receive the cash awards.

The purpose of the Planned Lighting Awards is "to give recognition to the utility operating companies which are most effective in raising the standard of lighting in their community. Equal emphasis will be given to educational programs on the relationship of light and sight for the public and allied industries, and to sales promotional programs to sell Planned Lighting in the entire local market."

Programs sponsored during the twelve-month period ending December 31, 1949, will be considered. All entries must be postmarked or received at the Edison Electric Institute not later than midnight, February 15, 1950. All electric utility operating companies, whether or not members of the EEI, are eligible to compete.

Separate entries must be made for each of the different types of market in the area served by the company. All homes—urban, suburban and rural—will be included in the residential market, while the commercial market will consist of schools, offices, public buildings, stores and comparable trade establishments. The industrial market will include all local industries.

The judges will be appointed by the Chairman of the Commercial Division General Committee, the EEI Commercial Director and the Chairman of the Better Light-Better Sight Bureau. The judges' decision as to the winning entry will be based on two main factors—educational activities in the principles of Better Light-Better Sight, and sales promotion and selling of planned lighting installations.

Educational activities include education of company personnel, personnel in other branches of the electrical industry, and the education of all categories of consumers. Sales promotion includes consideration of company organization and methods, cooperative activities with local electrical industries and trades, advertising and promotion activity, and the overall results achieved.

The Better Light-Better Sight Bureau suggests that the Planned Lighting Program Plan Books may be helpful in preparing entries. Elaborate entries are unnecessary. Simple reports and exhibits in evidence of accomplishments should be presented.

Presentation of the Planned Lighting Awards will be made at the 1950 Annual Convention of the Institute.

GEORGE A. HUGHES AWARDS

The George A. Hughes Awards this year offer prizes totalling $2400 for outstanding achievement in the promotion of electric kitchen equipment. Offered by Hotpoint Inc., through the EEI, the awards have been expanded this year to include five separate categories—electric kitchen promotion, electric range promotion, electric water heater promotion, electric dishwasher promotion and commercial electric cooking promotion. The first place company in each category receives a trophy, while the company placing second in each class receives a plaque. In the electric kitchen category, the individual winner receives $500, while the person placing second is awarded $300. Individual winners in each of the other four classes will receive $250, while those placing second will each be awarded $150.

The judges will base their selections on advertising and publicity methods, merchandising methods, activities with builders and architects to promote electric kitchen and water heating in new homes, activities of utility home economists in promoting electric cooking, and other promotional activities.

Any electric utility operating company is eligible to enter the competition. Entries should include a complete list of all promotional activities in the class (or classes) being entered. Companies entering are advised to include any supporting material as well, such as direct mail samples, displays and proofs of advertisements.

Entries must be received at the Institute postmarked not later than February 1, 1950. Presentation of the awards will be made at the Annual EEI Sales Conference in April, 1950.

THOMAS W. MARTIN AWARD

The Thomas W. Martin Rural Electrification Award consists of a plaque, presented to the winning company, and is offered annually by Thomas W. Martin, Chairman of the Board, Alabama Power Company, to the operating electric company that makes the greatest contribution to the progress of farm electrification and to general agricultural development.

Factors to be considered by the judges will include agricultural advancement within the company's area due to use of electricity; organization and plans for conducting a rural development program designed to build a more prosperous agriculture; cooperation with other agencies; standard of service to farm customers, including new engineering developments on rural lines; and development of farm load.

Elaborate and costly entries are unnecessary. The merit and success of the activities described will be the prime factor considered by the judges, not the method of presentation. Reports and exhibits for 1949 must be forwarded to the Secretary of the Institute by February 1, 1950. Presentation of the award will be made at the 16th Annual Sales Conference of the EEI in April, 1950.

LAURA McCALL AWARDS

Offered by *McCall's* Magazine through the Edison Electric Institute, the Laura McCall Awards, consisting of bronze plaques and cash prizes totalling $1000, are designed to give public acknowledgment to outstanding achievements or ideas in home service work which advance modern homemaking through electrical living.

Achievements and ideas may include home call operation, kitchen planning, education of the homemaker in the use of electrical appliances, home lighting activities, community or educational group activities, home service calls and other helps on equipment sold by dealers, employee education programs and cooperation with other departments within the company, or any other outstanding home service activity.

Three separate divisions will allow equal opportunity to Home Service personnel on a national basis. Division A includes companies in which the entire home service personnel totals more than three individuals. Division B is restricted to companies having not more than three home service representatives. The winning home service director in each of these divisions receives $200 and an engraved plaque for making the greatest contribution in any one or more of the activities listed above.

Awards in Division C will be made to individual members in the Home Service Departments of three different companies "whose individual ideas, in the opinion of the judges, make, in the most practical and original manner, the greatest contribution to the advancement of modern homemaking."

Although individuals and companies may compete in more than one division, only one award will be made to an individual or company. The contest covers the year ending February 1, 1950, and entries must be received at the Institute postmarked not later than that date. The awards will be presented at the 1950 EEI Sales Conference in Chicago, Ill., April 4-6.

CLAUDE L. MATTHEWS VALOR AWARD

The Claude L. Matthews Valor Award was established to "honor acts of devotion to duty wherein extraordinary courage has been excercised in efforts to maintain important electric service or to restore service in the shortest possible time."

This year, as in the past, three cash awards of $150 each will be made available by Claude L. Matthews, President, W. N. Matthews Corporation, to the electric utility employee or employees qualifying as most deserving of the Award. In addition a citation, and a handsome 2½-inch bronze medal will be given to each recipient of the Award. Employees of any electric company, publicly or privately owned, are eligible.

Factors that will be given weight in judging the awards will be the importance of the service affected, the courage, the good judgment, the quick action and the devotion to duty displayed by the employee.

The chief executive of the utility must submit the recommendation for the Award, including a citation of the act of devotion to duty, the duty or duties with which the recommended employee was charged, a brief description of the events, a statement of the deed upon which the claim for the award is based and a brief history of the employee's service.

Recommendations for 1949 must be received by the Secretary of the Institute not later than March 1, 1950.

REDDY KILOWATT ANNUAL REPORT AWARD

Presentation of the Reddy Kilowatt Annual Report Award will be made at the EEI's Annual Convention in June 1950. Established in 1939, the Award consisting of a bronze plaque, is made annually to the electric light and power company that "best illustrates, humanizes and simplifies to stockholders the company's operations during the preceding year."

All electric companies are eligible to enter the contest. Five copies of the 1949 annual report of each competing company must be received by the Reddy Kilowatt Service, 50 Church Street New York 7, N. Y., on or before May 15, 1950.

Socialist Failure in Jamestown Colony

AFTER the failure of the communistic experiment of the Jamestown Colony, Captain John Smith established his famous rule that:

"He who does not labor shall not eat."

Writing of the results of this policy he said:

"When our people were fed out of the common store and labored jointly together, glad was he who could slip from his labor or slumber over his task, he cared not how. Nay the most honest among them would hardly take so much true pains in a week as now, for themselves, they will do in a day. Neither cared they for the increase, presuming that howsoever the harvest prospered, the general store must maintain them; so we reaped not so much corn from the labors of thirty as now three or four do provide for themselves."

Quoted from Captain John Smith: *General History of Virginia*, p. 516 of 1 Vol. Ed.—Arber Book.

Electrical Equipment Committee Meeting

B. Van Ness, Jr., *Chairman*

THE Electrical Equipment Committee, with nearly 85 members and guests present, held its 49th meeting at the Van Curler Hotel, Schenectady, N. Y., on October 3 and 4. On October 5, the Committee members were the guests of the General Electric Company. This part of the program consisted of interesting talks on various advances in the design of transformers, circuit breakers, generators, synchronous condensers, turbines, etc., followed by a tour of the company's new turbine generator plant and the Knolls Research Laboratory.

Changes in Committee Organization

E. H. Snyder will be chairman of the Apparatus and Design Division to fill the place of H. B. Wood. As the replacement for E. S. Fitz, C. L. Derrick will head the Operation and Maintenance Division. A. C. Gohlke will replace J. H. Foote, now vice chairman of the committee, as head of the Utilization Division. The members of the committee were unanimous in expressing their appreciation of the fine work the former chairmen had accomplished during their tenure.

In accordance with recent practice, the first day's session was devoted to the closed session discussions of apparatus troubles, system disturbances, and other appropriate subjects of interest primarily only to the committee members and utility company guests.

A report on progress on the Joint Electrical Equipment and Prime Movers Committee on sleeve versus ball bearings was outlined by R. W. Wilbraham, chairman. A questionnaire is nearing completion which will be distributed around November 1. Every effort was made to keep the questionnaire simple and yet provide the committee with information necessary to study the problem. A prompt reply to the questionnaire from 100 per cent of those receiving it will facilitate further progress in this field.

F. S. Brown presented a summary of oil fires reported, which included the period since October, 1948. Twelve cases of oil fires were reported, of which five involved transformers and three involved oil circuit breakers. None of the fires were classed as serious.

The Apparatus Trouble Report was presented by F. S. Brown for the period February 15, 1949, to August 15, 1949. A total of 235 cases of troubles were reported, of which 77 are classed as of major interest. Motors and transformers—over 500 kva accounted for 13 cases each of the troubles classified as major. Lightning accounted for only 1 per cent of the total cases as compared to 22 per cent for the similar period in 1948. Replies were received from only 57 per cent of those solicited. A higher percentage of replies would increase the value of these reports.

Detailed reports by individual members were presented of some major cases of troubles. These were followed by a round table discussion of the causes and methods of prevention of the cases described.

Discussion of F.C.C. Rules relating to carrier systems and incidental radiation devices, Proposed AIEE Guide for Dry Type Transformers, transformer audible noise, and experience with pneumatically operated oil circuit breakers completed the closed session part of the meeting.

Operation and Maintenance Division

E. F. Walsh of the Narragansett Electric Company gave an interesting and complete report of "The Care of Insulating Oils for Electrical Equipment." (This paper is printed elsewhere in this issue of the BULLETIN.)

Prepared discussions by R. G. Call, American Gas and Electric Co., and F. R. McLean of the Pennsylvania Power and Light Co., indicated that there was some disagreement as to whether the interfacial tension and power factor tests were the only tests necessary to completely determine the condition of the insulating oil. Determination of the neutralization number and dielectric tests were considered by Mr. McLean to be necessary for a criteria of the existence of oxidation products. The efficacy of various types of inhibitors for insulating oils was also subject to some question.

"Problems of Safety in Stations and Substations" was discussed by N. E. Brown of the Buffalo Niagara Electric Corp.

Out of the 835 fatalities reported within the electric light and power industry during the period 1941 to 1947, 248 occurred at stations. Analysis of these accidents by the EEI Accident Prevention Committee clearly indicate *how* and *why* these accidents happen. The problem is to *prevent* the accidents from happening. Designers, engineers, and executives necessarily must share a portion of this responsibility with the operating men,

Designs should be such that safety does not depend on the alertness, skill and balance of the workmen. Rather, ideally, it should provide adequate clearances, etc., so that even with mental lapses, which are an ever present possibility, accidents will be minimized. The use of barriers, adequate clearances, simplification of circuit layouts, portable substations to enable less work on energized structures, etc., all will help to prevent accidents.

R. N. Southgate, Public Service Electris and Gas Co. of New Jersey, and J. W. Miller, The Detroit Edison Co., gave prepared discussions which illustrated the many improvements in designs and operating procedures instituted by their respective companies to minimize accidents at stations and substations. The use of barriers, simplified bus structures which readily can be analyzed by eye, interlocks, safety watchmen, supervision by station operators, were among the methods described.

System Engineering Division

"The Practical Application of Daylight Intensity and Temperature Measurements to System Operation" was the subject of a presentation by R. F. Brower, supplementing a paper prepared by J. S. Drummond of Consolidated Edison Co., entitled "Correlation of Electric Loads with Weather Variables." The type of load served by this company is unusually sensitive to variations in daylight intensity and temperature. To properly analyze load trends and, to a limited extent, daily load forecasting, correlation of the effects of daylight intensity and temperature with system load is necessary and useful. Daily load forecasting based on these two factors is severely limited because of the inherent variations in present-day weather forecasting, particularly that relating to daylight intensity. The paper by Mr. Drummond describes the detailed methods used in correlating the variables along with results obtained in analyzing

load data for the Consolidated Edison Company System.

Apparatus and Design Division

A description of the 69-kv bulk power supply system to load centers from the New East River Plant was presented by A. M. deBellis of the Consolidated Edison Co. of N. Y., Inc. A cost analysis of recent installations involving power supply from generator terminals to load centers was instituted which broke down the costs between the three major elements: building structures for electric galleries, switchgear and subtransmission. This study indicated that 75 per cent of the cost was required for the buildings and equipment. Of this percentage, 30 per cent represented the building and 70 per cent the switching and miscellaneous equipment constituting the galleries. Consideration of reliability of service, space limitations, etc., along with efforts to reduce costs led to the choice of design with the following advantages and objectives:

1. Elimination of multi-story gallery buildings or entire building structures.
2. Reduction of high capacity switching and bus equipment and high interrupting capacity circuit breakers at low voltage.
3. Simplify outgoing cable design by using three conductor cable of highest voltage that can be accommodated in present duct system.
4. Electrical galleries to be designed for construction on "pay as you go" basis which requires flexibility for future load growth without advanced plant investment.

With these considerations in mind, the design adopted provides for 69-kv supply to the network area to be fed from the plant with a minimum of 69-kv switching and bus work involved. Four 69-kv circuits using oil filled shielded cables will supply each substation which step down to the 13-kv networks. Any two of the 69-kv circuits will be paired on one circuit breaker position at the generating plant.

D. W. Taylor of the Public Service Electric and Gas Co. of New Jersey described the "Control Room Lighting of the Sewaren Station." Striving for improvements in illumination of the control room and instrument boards, a mock-up model of the control room was constructed. Various lighting schemes were tried which led to the adoption of a parabolic curved ceiling. The curvature forms a surface so related to the light source that the upward component is directed towards the vertical instrument and switchboards rather than the even distribution normally attained with the usual flat surface used with indirect lighting. A new cover for the instruments was developed for the installation which eliminates the usual shadow on the instrument face from the top cover when down lighting is used. The fluorescent lights used are of the instant-start type with incandescent lamps fed from the station batteries available for emergency service.

Foreign Practice Division

In addition to reports from W. R. Way concerning recent Canadian developments and from A. V. DeBeech on developments in other foreign countries, a comprehensive description of "System Planning on the Shawinigan Water and Power Company's System," prepared by E. W. Knapp and J. M. Crawford, was presented by Mr. Knapp. The present peak load on the system is 1,200,000 horsepower and it is estimated that by 1953 it will be 1,500,000 horsepower. All generation is from hydro power, primarily on the St. Maurice River. The area served is relatively large and thinly populated, necessitating transmission of large blocks of power over considerable distances. Transmission and subtransmission voltages are 220 kv, 130 kv and 66 kv. Provision for sleet melting is important and at each main station is provided for by means of a transfer bus. The general scheme of operation is to maintain relatively flat voltage on the main receiving busses and variable voltage on main sending busses. This is accomplished by varying generator voltage, the use of regulators and regulating transformers, static capacitors and synchronous condensers.

Transmission and Distribution Committee Meeting

J. E. McCormack, *Chairman*

THE fiftieth meeting of the Transmission and Distribution Committee was held on Oct. 31 and Nov. 1 at the Lord Baltimore Hotel, Baltimore, Maryland, with 150 members and guests in attendance.

Safe Design, Construction and Operation

The session on safe design, construction and operation, sponsored by C. E. Bathe, featured a discussion of pole top grounding practices. T. J. Brosnan opened the discussion by noting that many fatalities involve contact with grounds at the pole top, noting the varying grounding practices among companies and questioning the desirability of bringing ground conductors into the primary area. Many companies avoid this problem at the higher distribution voltages through the use of hot line tools and Mr. Brosnan suggested possible consideration of their use at the lower voltages. He also suggested more effort to remove lines from service for maintenance.

J. A. Pulsford and G. E. Dean pointed out that poles have sufficient conductivity to provide dangerous paths to ground, thus elimination of metallic grounds in the primary area creates a false sense of security. E. W. Oesterreich emphasized the futility of trying to build accident proof structures, noting that more contacts occur on jobs on simple structures than on complex structures where the necessity for alertness is more obvious. While recognizing the need for attention to safety in design, he stressed the advantages of investment in safety training over the provision of excessive increases in clearances and working space.

Standards and Specifications

Subcommittee chairmen reviewed activities of the Standards and Specifications Group, sponsored by W. E. Losie.

F. A. Ashbaugh announced that TD-90, "Specifications for Douglas Fir Crossarms, Treated or Untreated," has been released for publication. Good progress is being made on a specification for Southern Pine crossarms with the objective of providing for an equivalent to the Douglas Fir crossarm.

R. M. Havourd reported that T & D Committee balloting on EEI-NEMA specifications for suspension, spool and strain insulators has been completed. A few minor modifications will be made as a result of comments received. Work

on specifications for low- and high-voltage pin and high-voltage post insulators is under way.

E. K. Karcher announced that the revised edition of TD-1, "Specifications for Bolts and Nuts," has been published. EEI-NEMA "Specifications for Standard Mounting Bracket for Distribution Cutouts and Distribution Lightning Arresters" (EEI Publication No. TDJ-19), is being printed. First drafts of proposed specifications for pole-top pins and guy clamps have been reviewed by the Line Hardware Subcommittee and a first draft of a revision of TD-3, "Specifications for Lag Screws" is ready for review.

W. L. Vest, Jr., reviewed the status of proposed EEI-NEMA standard characteristics for distribution fuse links. Tentative characteristics approved by the T & D Committee are now under study by the various fuse manufacturers.

On behalf of R. J. Palmer, W. E. Losie reported that consideration of a few last-minute suggestions for changes has delayed completion of EEI-NEMA street lighting equipment specifications for filament lamps, photometric tests for luminaires, voltage classification and pendant luminaire mountings.

General Engineering

The General Engineering Group, sponsored by J. W. Anderson, covered a wide variety of subjects.

E. V. Sayles, H. P. Sleeper, G. B. Dodds, F. E. Davis, Jr. and C. P. Xenis reviewed details of the AEIC-EEI Joint Report on Branch Circuit Overcurrent Protection (EEI Publication No. R-9).

A closed session, with attendance limited to members and other utility representatives, included discussion of dry-type transformer failures.

W. C. Phillips reported that both regional and national frequency coordination plans for mobile radio service were completed by the National Committee on Utilities Radio and approved by the FCC early in July. Allocations now are being made almost entirely in accordance with these plans although the backlog of applications for frequency modifications now has reached a point where about 90 days is required for processing by the FCC.

A Communications Subcommittee has been appointed to study that part of recently FCC proposed rules relating to carrier current systems. Arrangements have been made to conduct measurements of radiated field strengths on several types of transmission circuits.

G. E. Dean presented a letter distributed to all television dealers in his company's area asking for cooperation to insure that all television antenna installations maintain a safe clearance from power lines and are supported and guyed to withstand ice and wind loads.

A session on major system troubles included a report describing the effects of the April 13 earthquake in Washington state by J. Bankus on behalf of M. T. Crawford. Power system damage was slight despite an earthquake intensity of eight. J. B. Hiers, Jr., described the effects of the most severe of the four hurricanes experienced in Florida this year. There was extensive damage to the power system but improved construction methods, an extensive FM radio communications system and a carefully planned emergency organization procedure paid off in speeding restoration of service. G. F. Switzer reported difficulties with restrikes in switching large 34.5 kv banks and the chairman described an outage caused by cross-phasing a 27-kv feeder.

Underground Group

The Underground Group, sponsored by J. A. Pulsford, held a closed session to discuss high-voltage cable terminal failures.

M. W. Ghen reported that review of the second draft of proposed EEI-NEMA standards for conventional submersible-type transformers has been completed and that preparation of a tentative First Report is underway. An initial draft of proposed standards for network transformers also is being prepared.

Final data on 1947 cable operations were summarized by J. J. Pokorny. The cable failure rate of 5.6 per 100 cable miles was the same as in 1946. Non-inherent causes accounted for 77 per cent of these; 37 per cent being due to mechanical damage and 30 per cent due to corrosion. Total failure rates as well as rates for the various types of failure varied widely among companies.

J. A. Pulsford reported appointment of a subcommittee to revise and simplify the Network Operations Report in an effort to eliminate non-essential information and speed up reporting, compilation and publication.

C. T. Hatcher announced that the AEIC and EEI jointly will sponsor continuation of tests on losses in pipe-type cable initiated by the Consolidated Edison Co. of N. Y., Inc.

A new sectional, precast concrete manhole described by L. G. Kraft features separate upper and lower wall sections one of which contains openings in adjacent walls. This section can be turned, inverted or interchanged with the other section to provide a total of 16 different locations for conduit connections. G. H. Fiedler then described experimental use of standard cattle-pass sections for sectional precast manholes. The only modification is a cast hole in the top of one section to serve as an entrance. Ends are built of concrete blocks.

A new, highly maneuverable cable reel lifting truck for pulling cable in or out was described by L. W. Clark.

A symposium on practices governing the use of space on customers' premises and sidewalk areas for transformer vaults revealed considerable variation due primarily to city ordinances and other local conditions beyond the control of the utilities. J. W. Anderson, M. W. Ghen, D. C. Hawley, R. E. Morse, W. M. Penney, J. A. Pulsford, W. R. Weise, W. S. Wilder and W. J. Witte described detailed practices in cities with extensive underground systems.

Overhead Group

J. W. Anderson, G. E. Dean, H. J. DeBaun, J. W. Drummond, W. M. Penney, E. C. Rue and W. S. Wilder participated in a panel discussion on restoration of service after severe storms, conducted by L. G. Smith, sponsor of the Overhead Group. Most agreed that normal weather reports are of limited aid, particularly when icing conditions may vary widely between local areas only a few feet apart in elevation. Several companies provide for systematic reporting by company personnel located throughout the system area and considerable use is made of reports from adjacent companies. Several companies have extensive and detailed plans for reorganization and decentralization to cope with severe storms.

M. H. McGrath of the General Cable Corporation, L. L. Carter of the Anaconda Wire and Cable Company and E. J. Merrell of the Phelps Dodge Copper Products Corporation each presented papers describing recent progress in coverings for weatherproof wire.

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EEI General, Accounting, and Engineering Committees Seek Efficiency, New Ways to Serve Public

(*Continued from page* 406)

solution of these problems. Much of this valuable information is made available to the public through the Prime Movers Committee Reports which have a world-wide circulation and which are unique in technical literature. Since its formation in May, 1911, the committee has published 195 formal reports on various subjects within its scope. An interesting article about the committee and its work was published in the July, 1948, EEI BULLETIN.

Plans for the administrative year include four meetings, the first of which was held on Oct. 10 and 11, 1949, at Rochester, N. Y.

The basic work of the Prime Movers Committee is done by subcommittees formed from time to time to study subjects of particular interest. Subcommittees currently include those on Boiler Auxiliaries, Boilers and Combustion, Coal and Ash Handling, Gas Turbines, Metallurgy and Piping, Oil and Gas Power, Power Station Chemistry, Power Station Data, Power Station Personnel, and Turbines and Condensers.

The Power Station Chemistry subcommittee, for example, is a group of about 50 chemists in the power plant field who hold their meetings twice a year. The minutes of these meetings are published and distributed to all members of the Prime Movers Committee.

The Steam Contamination Research Project is sponsored by the Prime Movers Committee in cooperation with the AEIC and an advisory committee of the turbine and boiler manufacturers. The research program is being conducted at the Armour Research Foundation.

Members of the Committee also act in the interests of the industry with such national engineering committees as the A.S.T.M. or the A.S.M.E. They also cooperate on various occasions with manufacturers and others in the solution of serious operating problems.

Transmission and Distribution Committee

The Transmission and Distribution Committee under J. E. MCCORMACK, Consolidated Edison Co. of New York, Inc., New York, N. Y., chairman, plans three meetings this year. The fall meeting was held in Baltimore, Oct. 31 and Nov. 1, 1949. The winter meeting is scheduled for Detroit, Feb. 20 and 21, 1950, and the spring meeting for Denver, May 25 and 26, 1950.

This Committee functions through five groups and various subcommittees. The five groups and their sponsors are: Overhead Systems, L. G. Smith; Underground Systems, J. A. Pulsford; General Engineering, J. W. Anderson; Standards and Specifications, W. E. Losie, and Safe Design Construction and Operation, C. E. Bathe.

Efforts are being made to have more of the members participate actively in the meetings and to have some responsibility by sponsoring particular subjects. It will be the endeavor of the committee to have more discussion at meetings, and to increase the exchange of information. One approach will be to devote a period to news in the industry, and reviews of major system troubles and new developments. Another will be the renewal of the practice of holding closed sessions. Closed sessions should permit more open discussion which will ultimately be of more benefit to both the electric companies and the manufacturers.

Particular attention will be given to having fewer papers and more discussion of the papers by the members and guests. The large size of the committee has, in the past, restricted the round table discussion. The panel type of discussion, instituted last year, will be continued in an effort to overcome the handicap of the large committee.

Care of Insulating Oils for Electrical Equipment

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periods of at least a year in advance, with the assurance that in the meantime there will be no failures due to faulty insulating oil. This system has been in successful operation for over five years and has resulted in a marked reduction in maintenance costs. In no case to date has insulating oil been removed or reconditioned which was not found as indicated by the quality control graph.

There has been considerable discussion lately regarding the use of retarders or oxidation inhibitors in insulating oils. At least one large manufacturer of transformers does not recommend using inhibited oils. Experience has definitely proved that properly refined petroleum oils fortified with oxidation inhibitors extend their sludge free life approximately seven times. There is no reason to doubt that petroleum oils of the insulating type will not react in the same manner.

The practice of discarding deteriorated insulating oil no longer need be continued. In fact, deteriorated or oxidized insulating oil can be reconditioned and fortified to give a service life far in excess of the best non-inhibited oil available and approach if not exceed the best modern inhibited oil. To accomplish this it is only necessary to filter the old oil through fuller's earth to an interfacial-tension value of 50 dynes, add the proper inhibitor and it is ready to give satisfactory service for many years. Experiments are still in progress which are aimed toward still further reduction in reconditioning costs with no loss in life expectancy.

The private electric companies must find additional ways to reduce the cost of operation and the proper maintenance of insulating oil is one way to make appreciable savings.

Transmission and Distribution Committee Meeting

(*Continued from page* 427)

M. H. Pratt reported that questionnaires and reporting forms for use in the AIEE-EEI survey of outages on transmission lines, 100 kv and above, have been distributed.

M. C. Henderson presented a report by W. P. Holben indicating that the AEIC-IPCEA-EEI joint subcommittee on preassembled aerial cable specifications must obtain additional information on preferred practices of users before proceeding further with the development of specifications.

On behalf of C. J. Beller, H. C. Bingham reported that 37 companies have indicated that they will report on representative circuits in connection with the AIEE-EEI study of coordination of construction and protection of distribution circuits. Basic data already has been received on 182 circuits and fault data covering the first half of 1949 has been reported on about half of these.

Joint EEI-AGA Committee Publishes Report on "Financing Utility Capital Requirements"

Financing Utility Capital Requirements. A report of the Joint Committee on Financing Utility Capital Requirements of the American Gas Association and the Edison Electric Institute. 132 pages. Price $1.00.

COVERING the "chief problem areas" in the financing of the expansion programs of the electric and the gas companies, the recently published report of the Joint Edison Electric Institute-American Gas Association Committee on Financing Utility Capital Requirements finds that improvement in earnings in both the electric and gas utility industries will be "particularly striking as new and more efficient plant facilities come into use, as cost levels stabilize or decline, and as adjustments are made in rates to raise earnings sufficiently to attract capital."

Co-chairmen of the Committee which developed the report, titled "Financing Utility Capital Requirements," are Harold H. Scaff, Ebasco Services Inc., who is also chairman of EEI's committee on the Application of Accounting Principles, and E. W. Morehouse of General Public Utilities Corp., member of AGA's Committee on Economics.

In a Foreword to the report, the Committee states that it "has tried to assemble facts, experience and suggestions on what are deemed the chief problem areas in this plant expansion financing program. Our aim has been to make available material that will be helpful to utility companies in both industries in working out their individual financing problems. We have not tried to frame an industry policy or chart a uniform course of conduct. We have also had in mind assembling information which may prove helpful to those outside the industry who are interested in financing problems from many points of view, whether as investors, investment analysts or advisers, underwriters and dealers, or regulators."

The Committee goes on to say that "It is hoped that such groups will be aided to a well-rounded picture of the electric and gas utility industries, their present financing problems, and their basic strength and bright future."

In approaching the problem of earnings from the investor standpoint, the report noted the favorable effect of recent regulatory commission action in approving rate adjustments. "In fact, by early 1949 many utility companies showed improved earnings from both rate increases and from new plants while industrial companies' earnings prospects appeared uncertain. As a result, investors began to look with more favor upon utility stocks."

The report goes on say, however, that "until recently dollar earnings available for common stocks of electric utilities had not increased favorably, nor in step with rising costs of money, when compared with earnings of industrial companies. . . . Nevertheless, over the years utility earnings have shown far greater stability in business depressions. This stability is now again making utility securities more attractive to investors."

Also characteristic of utility companies is the higher percentage of earnings paid out in dividends as compared to the manufacturing company percentage. In 1948, according to the report, industrials paid 44 per cent of the reported earnings available for common stock in dividends, while utilities paid 70 per cent. Because utility companies in general require much greater fixed capital per dollar of revenue than do industrial companies, they must depend to a far greater extent on the capital market for the financing of large-scale expansion. Hence, "they must maintain dividend payments to attract new capital on advantageous terms."

After detailing the factors making greater utility earning power necessary, the report shows that only a 2.9 per cent increase in the revenue of a representative electric company "would be needed to reduce by approximately 25 per cent the price disparity of a utility common stock compared with an industrial stock, at currently or recently demanded dividends and earnings yields."

The report warns against the selling of new stock "at prices lower than is proper and fair" as a "self-defeating or self-limiting device in the long run," causing "dilution and partial confiscation of the old stockholder's investment and impairing his confidence," and states that "sufficient new earnings must be produced to support the additional common stock at a level commanded by the existing shares."

In discussing possible programs of financing, on an industrywide basis, the report notes that in a program stressing common stock as the principal source of capital, composite per cent of return to the investor on the three main security classifications would be from 6.5 to 7.7 per cent. In a program in which bonds would be the major source of new money, the composite per cent would range from 5.9 to 6.9 per cent. The report says that "these figures suggest that, broadly speaking, no sharp or appreciable increases of revenue are required to maintain standards of earning power on utility capitalizations allowed and earned in the past."

A major suggestion was made in the chapter on competitive bidding where the Committee recommended that:

"The Securities and Exchange Commission temporarily suspend the applicability of Rule U-50 to sales of electric and gas utility preferred and common stocks, and adopt a new rule providing that such sales may be made by any method, stipulating that the Commission retains jurisdiction over the reasonableness of price and spread. The suspension should be made permanent if after a trial period of two years, the new procedure is found satisfactory. It could be revoked at any time if the Commission found there was a return to conditions which it determined were unsatisfactory.

"The Securities and Exchange Commission increase the exemption from competitive bidding on debt transactions to $3,000,000 in any one calendar year, from the present level of $1,000,000."

Besides the chapters on earnings and competitive bidding, the report includes a summary of material covered in the study, an introduction discussing various phases of expansion, and chapters titled "Financial Information Program," "Relations with Investors, Bankers and Dealers," "Characteristics of Securities," and "Impact of Federal Taxation on Utility Financing."

PERSONALS

THOMAS W. MARTIN has been elected Chairman of the Board of the Alabama Power Company, and JAMES M. BARRY has been elected to succeed Mr. Martin as President of the company. LEWIS M. SMITH, a vice president of the company, was appointed general manager to fill the vacancy left by Mr. Barry when he assumed the presidency.

Mr. Martin stated that he expects to continue active connection with the affairs of the company in his new position as Chairman of the Board. Beginning with the organization of the original investors in the company 38 years ago, Mr. Martin has served the company in an executive position without interruption—the last 30 years as president. In 1911 as attorney for groups seeking capital to develop water power in Alabama, he joined with the founders of the Alabama Power Company, and became General Counsel when the company was established. Several years later he was elected vice president, and in 1919 assumed the duties of the presidency until elected to that position by the Board in 1920.

"We look with much pride upon the many job opportunities which have been created because electric service was available throughout the State," said Mr. Martin. "Thus, living conditions have been improved, and the social well-being of our state has advanced with its economic improvement. We are perhaps more active now in this effort than at any time in the history of the Company, and we believe that the results will be even greater in the future than in the past."

Mr. Martin has been active in many civic and community affairs including the Community Chest, the Committee for Economic Development, and the Southern Research Institute.

Mr. Barry, a native of San Francisco, Calif., and a graduate electrical engineer of the University of California, served with the Electric Department of the City of San Francisco for a short while after graduation, and then entered the employment of the Northwestern Electric Company at Portland, Ore. In 1918 he went with Alabama Power Company as local manager of its Anniston operations and later as manager of the Eastern Division of the Company. In 1921 he became chief engineer of the company in charge of the construction of the Mitchell Dam Project; in 1923 he became manager of the Southern Division of the Company at Montgomery, and later in the same year, he was made manager of Retail Operations of the Company. Mr. Barry was elected vice president of the company in 1926, and since 1932 has been a director and general manager of the Company.

Mr. Smith is a native of Jefferson County, and a graduate of the College of Engineering at the University of Alabama. He joined the Engineering Department of Alabama Power in 1923 as a draftsman and became chief electrical engineer in 1939, serving in that capacity until 1944, when he became manager of the Public Relations Department of the company. He was elected vice president in 1945 and a director in 1949.

Mr. Smith is President of the Birmingham Chamber of Commerce, member of the Alabama Board of Registration for Professional Engineers and Land Surveyors, a member of the Jefferson County Zoning and Planning Commission.

MR. MARTIN

MR. BARRY

E. T. MOORE, director of residential sales for Virginia Electric & Power Co., Richmond, has resigned to become vice president and general manager of the Commonwealth Sales Corp. in Richmond. Mr. Moore has been engaged in sales and promotional work in the electric utility field in Florida and Virginia since 1926. He went to the Vepco system from Virginia Public Service Co. in Alexandria when that company merged with Vepco in 1944.

EDWARD J. INGRAM has been appointed vice president in charge of sales and commercial activities for Jersey Central Power & Light Co., Asbury Park. He succeeds Thomas R. Dobson, who died suddenly Sept 18.

Mr. Ingram comes to Jersey Central from Reading, Pa., where he spent the past 15 years as a Metropolitan Edison Co. executive, first as lighting director and later in charge of sales and related activities. Before joining Metropolitan he was with Public Service Co. of Northern Illinois.

HAROLD A. SMITH, formerly public relations director of Young & Rubicam, has been appointed associate public relations director of American Gas & Electric Service Corp. His experience includes 12 years in the publicity department of the *New York Daily News*, five years as promotion manager and sales promotion manager of *Liberty* Magazine; and seven years with Young and Rubicam, where he was successively copy chief, manager and director of the public relations department.

FRANK E. SANFORD has been appointed assistant chief electrical engineer of Commonwealth Services Inc. (formerly Commonwealth and Southern

Corp.), Jackson, Mich. He was formerly Superintendent Distribution Engineering of The Cincinnati Gas and Electric Co., resigning in 1946 to become western editor of *Electrical World*. Subsequently he directed several research projects for Copper Wire Engineering Association and was a consultant for Line Material Co. Mr. Sanford is a past Chairman of the EEI Transmission and Distribution Committee and was formerly a member of two EEI-NEMA joint committees—Standards for Distribution Transformers and Preferred Voltage Ratings. He is the author of "Electric Distribution Fundamentals" and of numerous articles and papers on distribution.

E. F. DISSMEYER has been appointed General Staff Engineer of Commonwealth Services Inc. He has been with the organization over 23 years, most recently responsible for system planning and special engineering studies, and in his new position he will assist in the general coordination of planning and general engineering. Mr. Dissmeyer is a member of the EEI Electrical Equipment Committee, the ASA Rotating Machinery Committee and the AIEE Rotating Machinery and Power Generation Committees. He is at present Chairman of the AIEE Michigan Section.

R. J. WENSLEY, who has been appointed supervisor of operations of Commonwealth Services Inc., will be responsible for operational and personnel activities, job progress and procedures. Mr. Wensley was general manager of Wilcox Gay Corp., prior to joining the Commonwealth organization. He was formerly with Westinghouse Electric Corp. as a design engineer and later was general manager of I-T-E Circuit Breaker Co. He is the author of numerous articles relating to equipment for automatic and supervisory control and about 50 patents have been issued to him.

R. I. OLSON has been appointed architect of Commonwealth Services Inc., and will serve as liaison between architects and engineers designing works of an architectural nature including heating, ventilating, air conditioning and lighting of buildings. Mr. Olson has practiced as a professional engineer and as an architect, and is a corporate member of the American Institute of Architects.

Texas Power & Light and New Orleans Public Service Inc. Win Annual Safety Awards

TOP honors went to the Texas Power & Light Co., and New Orleans Public Service Inc., in the Annual Safety Award competition for Ebasco client companies, it was announced October 25th at a safety luncheon held during the 3-day Annual Safety Meeting at Chicago, Ill., sponsored by Ebasco Services Inc.

The Award is presented to companies with an accident record better by 25 per cent or more than the national average accident experience for their particular industry. Texas Power & Light had an injury index 90.78 per cent below the national average for electric companies and the New Orleans company an index 87.24 per cent below. Other companies winning the award included: Superior Water, Light and Power Co., Mississippi Power & Light Co., Birmingham Electric Co., United Gas Pipe Line Co., Columbus and Southern Ohio Electric Co., and West Tennessee Gas Co.

Gold and silver plaques and achievement certificates will be presented to the presidents of these companies at Ebasco's Annual President's Meeting to be held in New York City, Dec. 5.

The Safety Meeting was conducted by W. T. Rogers, Safety Consultant, Ebasco Services Inc., under the general supervision of I. M. Carpenter, the firm's insurance manager.

Wisconsin Celebrates 25 Years of Farm Electrification at Connection of 100,000th Farm

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water heaters, cow trainers and electric fence controllers hadn't even been thought of in 1924, but are used by thousands of farmers today to lighten farm work and make for better farming conditions," Professor Duffee said.

An interesting historical footnote was added to the dual celebration of 25 years of farm electrification, and the connection of the 100,000th farm to electric operating company lines by the presence of the nephew of Dr. David Roberts. It was Dr. Roberts who in 1898 first used electricity on a Wisconsin farm. He secured his energy from an interurban trolley wire of the then Milwaukee Electric Railway and Light Company, served by the Wisconsin Electric Power Company.

At the celebration at Ripon, Dr. Roberts' nephew remarked, "It doesn't seem possible that it was more than half a century ago. The neighbors looked on it as sort of a joke. But when they saw the electric lights, then about the only use for electricity, they could see it was a great improvement over the oil lamp for the house and the lantern for the barn.

"We received service from the old interurban line, then owned by the Wisconsin Electric Power Company. During the transportation rush hours, the old carbon filament lamps used to waver, fade and come on again, but, nevertheless, we were glad to have this better and safer method of lighting our barns. Neighbors came in to see what electricity could do on the farm. It seems to me that a short time later we acquired a motor for the water pump and also put one on our milking machine."

G. W. Van Derzee, commenting on Mr. Roberts' remarks, said, "It's men with vision and courage like Dr. Roberts who have to be the pioneers in any development, and I salute him as the original pioneer of farm electrification in Wisconsin. We in the electric industry, too, like to think of ourselves as pioneers in rural electrification. Starting with Dr. Roberts' farm in 1898, we have pioneered rural line construction, developed new uses for electricity on the farm, engaged in extensive experimental work and established electricity as the farmers' low-cost, competent hired hand."

Impact of Taxation on Public Utilities

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administer. Outstanding among the taxes in this category, for example, is the Federal Electrical Energy 3 1/3 per cent Tax. Another tax in this category is the Transportation Tax. It may be well to briefly outline the difficulties concerning these taxes.

Federal Electrical Energy Tax

Electrical energy is a universal necessity. Excise taxes similar to this tax are not levied on other necessities such as water, food, rent, drugs, etc. The electrical energy tax is a hidden tax that increases the cost of electricity to the customer. The tax is imposed solely upon sales by privately owned utilities and not

upon sales by municipally, or, cooperatively owned utilities. This imposes an unfair burden upon the customers of the privately owned utilities who ultimately pay the tax. No tax is levied on other forms of energy derived from coal, oil, gas, and other sources.

Electrical energy produced for self-use is not taxed and to avoid serious competitive discrimination, Congress imposed no tax upon utility sales to industrial customers. However, electricity sold for *commercial* use is taxed. This non-taxability of *industrial* consumption and the taxability of *commercial* consumption has resulted in uncertainty and confusion because it is often impossible to unscramble the *commercial* and *industrial* activities of a business consumer. Inspections must be made frequently and costs to the companies of administration are out of all proportion to the tax paid.

Transportation Tax

The Transportation Tax was imposed as a war revenue measure and it has served its purpose. Because of the burden that its administration and collection places upon public carriers, the burden of the tax upon the mining, heavy goods, and other specific industries, and its competitive disadvantages to producers located long distances from sources of supply or markets, the prompt repeal of the transportation taxes would be desirable.

Other excise imposts which affect the private utility industries, the burden of which is difficult to determine, include taxes on radios, refrigerators, air conditioners, electric appliances, electric light bulbs and tubes. The repeal of these items deserves consideration along with the others previously discussed. In fact, all the excise taxes might be studied in the light of present day revenue requirements and the contribution of each thereto as well as their economic consequences.

Production Incentives at Wisconsin Electric Power Company

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executives become over-impressed with their seeming complexity. Sure, time and motion study have a place in the development of production incentives, after they have reached a high level of refinement, but we did not have a time-study man on the property in the beginning.

What little motion study we do now was adopted a quarter of a century after the plans were in successful operation. We have never employed a trained time-study man or an experienced Industrial Engineer. We have them, of course, but we made them out of our Electrical and Mechanical Engineers and some good High School graduates. We did not even buy a stop watch until several plans had been developed. I have no brief either for or against Industrial Engineering firms who are equipped to install incentive systems. I know little about them, but any Company embarking on a system of incentives must, sooner or later, build up its own group to develop, maintain and administer plans.

If I were with a company that no incentive plans—nothing but a sion to install some—I would start one young Engineer who has analy ability and the capacity for orig thinking, preferably a graduate of of the fine Industrial Engine courses which colleges and univers are operating. I would permit hi recruit assistance only as he pr need for it by producing tangible i That sounds like a humble begin We know it is, because that is w Wisconsin Electric Power Com began.

CONVENTIONS AND MEETINGS

DECEMBER

8 Industrial Relations Committee, EEI, New York, N. Y.
15-16 Committee on Financing and Investor Relations, EEI, Biltmore Hotel, New York, N. Y.
19-21 Winter Meeting, American Society of Agricultural Engineers, Stevens Hotel, Chicago, Ill.
21-22 National Farm Electrification Conference, Stevens Hotel, Chicago, Ill.

1950

JANUARY

19-20 Industrial Relations Committee, EEI, Roosevelt Hotel, New Orleans, La.
30-Feb. 3 American Institute of Electrical Engineers, Winter General Meeting, New York, N. Y.

FEBRUARY

13-14 Electrical Equipment Committee, EEI, Netherlands-Plaza Hotel, Cincinnati, Ohio.
16 Industrial Relations Committee, EEI, Palmer House, Chicago, Ill.
16-17 Pennsylvania Electric Association, Transmission and Distribution Committee, Penn-Harris Hotel, Harrisburg, Pa.
20-21 Transmission and Distribution Committee, EEI, Statler Hotel, Detroit, Mich.

MARCH

13-16 National Electrical Manufacturers Association, Edgewater Beach Hotel, Chicago, Ill.
16 Industrial Relations Committee, EEI, New York, N. Y.

APRIL

4-6 16th EEI Annual Sales Conference, Edgewater Beach Hotel, Chicago, Ill.
10-14 American Society of Mechanical Engineers, Spring Meeting, Washington, D. C.
17-19 1950 Conference of Electric and Gas Utility Accountants, Brown Hotel, Louisville, Ky.
20 Industrial Relations Committee, EEI, Netherlands-Plaza Hotel, Cincinnati, Ohio.
24-26 Purchasing and Stores Committee, EEI, Schroeder Hotel, Milwaukee, Wis.
25-26 Pennsylvania Electric Association, Accounting Conference, Pittsburgh, Pa.
26-28 American Institute of Electrical Engineers, North East District Meeting, Providence, R. I.

MAY

1-4 38th Annual Meeting, Chamber of Commerce of the USA, Washington, D. C.
11-12 American Institute of Electrical Engineers, Great Lakes District Meeting, Jackson, Mich.
15-18 54th Annual Meeting, National Fire Protection Association, Haddon Hall, Atlantic City, N. J.
23-26 National District Heating Association, Grove Park Inn, Asheville, N. C.
31-June 2 Pacific Coast Electrical Association, Inc., Reno, Nevada.

JUNE

5-7 Edison Electric Institute, Annual Meeting, Atlantic City, N. J.
12-16 National Electrical Wholesalers Association, Atlantic City, N. J.
12-16 American Institute of Electrical Engineers, Summer Meeting, Pasadena, Calif.
19-23 American Society of Mechanical Engineers, Semi-Annual Meeting, St. Louis, Mo.
26-30 American Society for Testing Materials, Atlantic City, N. J.

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